

1975

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INTERNATIONAL PACIFIC SALMON
FISHERIES COMMISSION

APPOINTED UNDER A CONVENTION
BETWEEN CANADA AND THE UNITED STATES FOR THE
PROTECTION, PRESERVATION AND EXTENSION OF
THE SOCKEYE AND PINK SALMON FISHERIES
IN THE FRASER RIVER SYSTEM

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ANNUAL REPORT

1975

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RICHARD NELSON

RODERICK HAIG-BROWN

DONALD R. JOHNSON

WILLIAM G. SALETIC

DONALD W. MOOS

NEW WESTMINSTER
CANADA

1976

INTERNATIONAL PACIFIC SALMON
FISHERIES COMMISSION

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AND PERIOD OF SERVICE
SINCE THE INCEPTION OF THE COMMISSION
IN 1937

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William A. Found	1937-1939
A. L. Hager	1937-1948
Senator Thomas Reid	1937-1967
A. J. Whitmore	1939-1966 1968-1969
Olof Hanson	1948-1952
H. R. MacMillan, C.B.E., D.Sc. .	1952-1956
F. D. Mathers	1956-1960
W. R. Hourston	1960-
Richard Nelson	1966-
Roderick Haig-Brown	1970-

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Fred J. Foster	1943-1947
Milo Moore	1946-1949 1957-1961
Albert M. Day	1947-1954
Alvin Anderson	1949-1950
Robert J. Schoettler	1951-1957
Elton B. Jones	1951-1957
Arnie J. Suomela	1954-1961
DeWitt Gilbert	1957-1974
George C. Starlund	1961-1966
Clarence F. Pautzke	1961-1969
Thor C. Tollefson	1966-1975
Charles H. Meacham	1969-1970
Donald R. Johnson	1971-
William G. Saletic	1974-
Donald W. Moos	1975-

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DIRECTOR — A. C. COOPER

ASSISTANT DIRECTOR — J. F. ROOS

NEW WESTMINSTER

CANADA

1976

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REPORT OF THE INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION FOR THE YEAR 1975

The 1975 fishing season for Fraser River sockeye and pink salmon was characterized by an abundance of management, industry and governmental problems coupled with low abundance of salmon. The various problems were reported at the Annual Meeting in December, 1975 and are also discussed within this report. They are serious matters for the fishing industry, but the solutions are not within the Commission's areas of responsibility as defined by the Sockeye Salmon Convention.

Important as it may be to resolve these problems, it is even more important that attention not be diverted from the objective of increasing the resource. The lack of agreement between Canada and the United States on funding of the Development Program recommended by the Commission early in 1972 does affect the ability of the Commission to fulfill its responsibilities under the Convention and this will be reflected in the catches of sockeye and pink salmon in coming years. These two species currently provide over 80% of the commercial catches of all Fraser River salmon and have always been the backbone of the fishing industry based on Fraser River salmon.

The abundance of the stocks of sockeye and pink salmon varies in response to the escapements obtained and to the environment in the rivers and lakes of the Fraser River system, in Georgia Strait, and in the Northeast Pacific Ocean. The Fraser River system is unique in the large number of relatively big lakes it has for rearing of sockeye. Historical catches, as well as current estimates of food supplies for sockeye in these lakes, show that the lakes could produce at least three times more sockeye than they do now. Production of pink salmon also could be five to six times larger than the present average, based on estimates of historical abundance. The necessary spawning grounds for such production are still available, although they are being encroached upon in some areas. Methods, proven by existing spawning and incubation channel installations, are known for increasing production of fry at the spawning grounds through improved environment for the incubation of eggs. The methods are biologically sound and would have a benefit-cost ratio of 9.5 to 1 based only on the increased production of sockeye and pink salmon. The Indian food fishery along the salmon migration routes in the Fraser River would also benefit from the increased runs. Other salmon and trout populations which feed on the pink and sockeye fry would be enhanced and thereby provide additional benefits to sports fisheries. The facilities may also be utilized by other salmon, and thereby provide additional benefits. For example, the Weaver Creek channel for sockeye had over 12,000 chum salmon spawners in 1972.

One of the purposes of the Convention, preservation of the sockeye and pink salmon stocks, depends on preservation of the spawning grounds and the environment. The Convention did not give the Commission any authority with respect to this purpose, other than to make recommendations for the removal of obstructions. However, through cooperative arrangement with the Fisheries Service and

the Environmental Protection Service, Canada Department of the Environment, the Commission is able to review proposals that may affect sockeye and pink salmon and to make recommendations for protection of the resource. The Commission has developed staff and research facilities for this purpose and important advancements have been made in protection of the stocks. However, decisions reflecting the policies of various levels of government, whether city, regional, municipal, provincial or federal, can affect production of these stocks. Public concern for the salmon resource and the environment is an important influence on these policies, but public support for preservation of the spawning grounds and the freshwater environment for salmon may wane if efforts are not made to use proven technology to develop the resource. The Commission urges the governments to reach agreement on proceeding with the recommended program for development of the sockeye and pink salmon stocks of the Fraser River system without further delay.

COMMISSION MEETINGS

The International Pacific Salmon Fisheries Commission held twenty-one formal and fourteen telephone meetings during 1975 with the approved minutes of these meetings being submitted to the Governments of Canada and the United States.

The first meeting of 1975 was held January 24, with Mr. W. R. Hourston serving as Chairman and Mr. Donald R. Johnson as Vice-Chairman and Secretary. The Commission met with the Advisory Committee regarding the tentative recommendations for regulatory control of the 1975 sockeye and pink salmon fishery in Convention Waters, as submitted to the Committee by the Commission on December 11, 1974. After certain revisions, the Commission approved the recommended regulations for submission to the two national governments. The Commission also approved the budget request for fiscal year 1976-77. It was decided that the question of United States Indian fishing rights in Convention Waters was not a proper concern for the International Pacific Salmon Fisheries Commission, whose areas of responsibility are defined by the Sockeye Salmon Convention. The Commission's Advisory Committee was composed of the following members for 1975:

<i>Canada</i>	<i>United States</i>
J. Brajcich Purse Seine Fishermen	N. Mladinich Purse Seine Fishermen
L. Monk Salmon Processors	D. Franett Salmon Processors
F. Nishii Gill Net Fishermen	R. Christensen Gill Net Fishermen
H. Stavenes (to June 12) Purse Seine Crew Members	G. Schuler Reef Net Fishermen
M. Ellis (to June 11)	G. Simmons
M. Guns (from June 12) Troll Fishermen	Troll Fishermen
H. English Sport Fishermen	E. Engman Sport Fishermen

The Commission met on June 12 in Tacoma, Washington. The Commission approved the reappointment of Mr. F. Nishii as a member of the Advisory Committee representing Canadian Gill Net Fishermen, and also the appointment of Mr. M. Guns as a member of the Advisory Committee representing Canadian Troll Fishermen replacing Mr. M. Ellis who had resigned. Mr. H. Stavenes resigned his position on the Advisory Committee representing Canadian Purse Seine Crew Members. After review of legal opinions, the Commission adopted the following policy with respect to management objectives during and after a strike or shutdown in the fishing industry: "During and after a strike or shutdown, objectives for catch and escapement of individual runs or stocks will be paramount considerations in determining the extent of fishing, as they are at all other times. Division of catch as nearly as practicable by fishermen of the two countries at the end of the season will be subject to practical limitations of management of the fishery for the benefit of the entire industry." Reports were given by the staff on the following subjects: 1. Fry and smolt migrations during the spring of 1975, 2. Development of an even year pink salmon run to the Fraser River, and 3. Delaying sockeye at the Seton Creek hydroelectric plant. Administrative and budgetary matters were also considered. At the request of the Washington State Fisheries Department, the Commission approved a change in the 1975 commercial fishing regulations pertaining to troll fishing in State Fishing Area No. 2. The Commission also discussed the lack of progress in securing approval of the Development Program recommended early in 1972, noting that the first benefits to the fishermen would have occurred in 1975 if construction had proceeded as planned.

During the period July 8 to October 7 inclusive, the Commission held seventeen formal and fourteen telephone meetings for adjustment of fishing regulations to achieve the desired escapement and, as nearly as practicable, equitable division of the allowable catch of Fraser River sockeye and pink salmon. On August 6 the Commission met with the Advisory Committee to discuss two problems, one concerning the inability to obtain adequate escapement through the Fraser Canyon as a consequence of the removal of Fisheries Service patrols since July 18, and the other concerning the status of regulations in United States Convention Waters. On September 16 the Commission viewed the sockeye escapement at the Stellako River and sockeye in the spawning channel on the Nadina River. On October 2 the Commission welcomed Mr. D. W. Moos as the new United States Commissioner replacing Mr. Thor Tollefson.

The twentieth formal meeting of the Commission was held on December 5. The Commission considered the proposed regulations and predictions for the 1976 sockeye run as well as administrative matters.

The twenty-first and final formal meeting of the year was held December 12 in Vancouver, B. C., when the Commission met with its Advisory Committee, staff and approximately 350 representatives of industry, government and press. The catch and escapement statistics for the 1975 sockeye and pink salmon season were presented by the staff. Reports were also presented on the following topics: 1. Production of sockeye and pink salmon from Commission spawning channels, 2. Summary of pollution investigations, 3. Effects of dredging and studies of the

Seton Creek hydroelectric installation, 4. Summary of research on developing even year pink salmon, an egg transplant on the Upper Adams River, and lake productivity studies. Prospects for the 1976 fishing season were reviewed and tentative proposals for regulating the 1976 fishery were released subject to further consideration by members of the industry and their representatives on the Commission's Advisory Committee. The Commission announced the forthcoming retirement from the Commission of Mr. R. Nelson, who had served the Commission as an Advisory Committee member since 1938 and Commissioner since 1966.

1975 REGULATIONS

Recommendations for regulations governing the 1975 sockeye and pink salmon fishery in Convention Waters were adopted at a meeting of the Commission held on January 24, 1975 and submitted to the two national governments for approval on February 24, 1975. The recommendations for Canadian Convention Waters were implemented during the fishing season under the Fisheries Act, British Columbia Fishery Regulations and subsequently by Order-in-Council dated December 18, 1975. The recommendations for United States Convention Waters were approved by the Department of State on April 11, 1975 and were implemented by an Order of the Director of the Washington State Department of Fisheries on May 20, 1975.

The recommendations of the Commission were as follows:

Canadian Convention Waters

"The International Pacific Salmon Fisheries Commission appointed pursuant to the Convention between Canada and the United States of America for the protection, preservation and extension of the Sockeye Salmon Fisheries of the Fraser River System, signed at Washington on the 26th day of May, 1930, as amended by the Pink Salmon Protocol signed at Ottawa on the 28th day of December, 1956, hereby recommends that, in the interests of such fisheries, the following Fraser River Sockeye and Pink Salmon Fishery Regulations for the season of 1975 be adopted by Order-in-Council pursuant of Section 34 of the Fisheries Act, namely:

1. (1) No person shall fish for sockeye or pink salmon with nets in the waters of the southerly portion of District No. 3 in that portion of Area 20 lying westerly of a line drawn true south from Sheringham Point Lighthouse to the International Boundary from the 26th day of June, 1975 to the 2nd day of August, 1975, both dates inclusive.

(2) No person shall fish for sockeye or pink salmon with purse seines in the waters described in subsection (1) of this section:

(a) From the 3rd day of August, 1975 to the 30th day of August, 1975, both dates inclusive, except from half past six o'clock in the forenoon to half past six o'clock in the afternoon of Monday and Tuesday of each week; and

(b) From the 31st day of August, 1975 to the 20th day of September, 1975, both dates inclusive, except from seven o'clock in the forenoon to seven o'clock in the afternoon of Monday and Tuesday of each week.

(3) No person shall fish for sockeye or pink salmon with gill nets in the waters described in subsection (1) of this section:

(a) From the 3rd day of August, 1975 to the 30th day of August, 1975, both dates inclusive, except from:

(i) half past six o'clock in the afternoon of Monday to half past six o'clock in the forenoon of Tuesday; and

(ii) half past six o'clock in the afternoon of Tuesday to half past six o'clock in the forenoon of Wednesday of each week; and

(b) From the 31st day of August, 1975 to the 20th day of September, 1975, both dates inclusive, except from:

(i) seven o'clock in the afternoon of Monday to seven o'clock in the forenoon of Tuesday; and

(ii) seven o'clock in the afternoon of Tuesday to seven o'clock in the forenoon of Wednesday of each week.

(4) No person shall troll commercially for sockeye or pink salmon in the waters described in subsection (1) of this section from the 3rd day of August, 1975 to the 20th day of September, 1975, both dates inclusive, except at times that net fishing may be permitted within that area.

2. No person shall fish for sockeye or pink salmon with nets in the waters of the southerly portion of District No. 3 embraced in Areas 17 and 18, and in the Convention Waters portion of District No. 1:

(1) From the 29th day of June, 1975 to the 19th day of July, 1975, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday of each week; and

(2) From the 20th day of July, 1975 to the 9th day of August, 1975, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Wednesday of each week; and

(3) From the 10th day of August, 1975 to the 6th day of September, 1975, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday of each week; and

(4) From the 7th day of September, 1975 to the 13th day of September, 1975, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday in the following described waters:

(a) The Fraser River upstream to the Canadian Pacific Railway Bridge at Mission City:

(i) In the Main Arm upstream from a straight line projected north and south magnetic through the Woodward's Training Wall West Light near Steveston; and

(ii) In Canoe Pass upstream from a line projected north and south magnetic through Brunswick Cannery; and

(iii) In the North Arm upstream from Oak Street Bridge; and

(b) Those waters lying westerly of a line projected from Point Grey to the westerly end of the North Arm Jetty, thence to Sandheads Light and thence to the International Boundary at the junction of District No. 1 and Area 17 and Area 18; and

(5) From the 14th day of September, 1975 to the 27th day of September, 1975, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday of each week in the waters described in subsection (4) paragraph (b) of this section.

3. No person shall fish for sockeye or pink salmon with gill nets in the Convention Waters portion of District No. 1:

(1) From the 28th day of September, 1975 to the 4th day of October, 1975, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday in the waters described in section 2, subsection (4) paragraph (b); and

(2) From the 5th day of October, 1975 to the 11th day of October, 1975, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday.

4. No person shall troll commercially for sockeye or pink salmon in that portion of the waters described in section 2 lying easterly and inside of a straight line projected from Gower Point at the westerly entrance to Howe Sound to Thrasher Rock Light, thence in a straight line to Salamanca Point on the southerly end of Galiano Island, thence in a straight line to East Point on Saturna Island, thence in a straight line toward Point Roberts Light to the intersection with the International Boundary, thence following the International Boundary to its intersection with the mainland, from the 10th day of August, 1975 to the 30th day of September, 1975, both dates inclusive, except at the times and locations that net fishing may be permitted within that area.

All times hereinbefore mentioned shall be Pacific Daylight Saving Time."

United States Convention Waters

"The International Pacific Salmon Fisheries Commission appointed pursuant to the Convention between Canada and the United States of America for the protection, preservation and extension of the Sockeye Salmon Fisheries of the Fraser River System, signed at Washington on the 26th day of May, 1930, as amended by the Pink Salmon Protocol signed at Ottawa on the 28th day of December, 1956, hereby recommends to the United States Government that regulations to the following effect, in the interests of such fisheries, be adopted for the year 1975, and that an approved copy of said regulations be forwarded to the Director of Fisheries of the State of Washington for implementation by virtue of authority in him vested by Section 6 of Chapter 112 of the Laws of the State of Washington of 1949, namely:

1. No person shall fish for sockeye or pink salmon with nets in the Convention Waters of the United States of America from the 26th day of June, 1975 to the 5th day of July, 1975, both dates inclusive.

2. (1) No person shall fish for sockeye or pink salmon with purse seines in the Convention Waters of the United States of America lying westerly of a straight line drawn from Angeles Point in the State of Washington across Race Rocks to William Head in the Province of British Columbia:

(a) From the 6th day of July, 1975 to the 9th day of August, 1975, both dates inclusive, except from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday and Tuesday of each week; and

(b) From the 10th day of August, 1975 to the 20th day of September, 1975, both dates inclusive, except from five o'clock in the forenoon to nine o'clock in the afternoon of Monday and Tuesday of each week.

(2) No person shall fish for sockeye or pink salmon with gill nets in the waters described in subsection (1) of this section:

(a) From the 6th day of July, 1975 to the 12th day of July, 1975; from the 20th day of July, 1975 to the 26th day of July, 1975; and from the 3rd day of August, 1975 to the 9th day of August, 1975, all dates inclusive, except from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday and from seven o'clock in the afternoon of Tuesday to half past nine o'clock in the forenoon of Wednesday of each week; and

(b) From the 13th day of July, 1975 to the 19th day of July, 1975, and from the 27th day of July, 1975 to the 2nd day of August, 1975, all dates inclusive, except from seven o'clock in the afternoon of Sunday to half past nine o'clock in the forenoon of Monday and from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday of each week; and

(c) From the 10th day of August, 1975 to the 16th day of August, 1975; from the 24th day of August, 1975 to the 30th day of August, 1975; from the 7th day of September, 1975 to the 13th day of September, 1975; and from the 21st day of September, 1975 to the 27th day of September, 1975, all dates inclusive, except from six o'clock in the afternoon of Sunday to nine o'clock in the forenoon of Monday and from six o'clock in the afternoon of Monday to nine o'clock in the forenoon of Tuesday of each week; and

(d) From the 17th day of August, 1975 to the 23rd day of August, 1975; from the 31st day of August, 1975 to the 6th day of September, 1975; and from the 14th day of September, 1975 to the 20th day of September, 1975, all dates inclusive, except from six o'clock in the afternoon of Monday to nine o'clock in the forenoon of Tuesday and from six o'clock in the afternoon of Tuesday to nine o'clock in the forenoon of Wednesday of each week.

3. (1) No person shall fish for sockeye or pink salmon with purse seines in the Convention Waters of the United States of America lying easterly of a straight line drawn from Angeles Point in the State of Washington across Race Rocks to William Head in the Province of British Columbia:

(a) From the 6th day of July, 1975 to the 9th day of August, 1975, both dates inclusive, except from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday and Tuesday of each week; and

(b) From the 10th day of August, 1975 to the 27th day of September, 1975, both dates inclusive, except from five o'clock in the forenoon to nine o'clock in the afternoon of Monday and Tuesday of each week.

(2) No person shall fish for sockeye or pink salmon with reef nets in the waters described in subsection (1) of this section:

(a) From the 6th day of July, 1975 to the 12th day of July, 1975; from the 20th day of July, 1975 to the 26th day of July, 1975; and from the 3rd day of August, 1975 to the 9th day of August, 1975, all dates inclusive, except from half past ten o'clock in the forenoon to half past nine o'clock in the afternoon of Sunday, from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday and from five o'clock in the forenoon to half past ten o'clock in the forenoon of Tuesday of each week; and

(b) From the 13th day of July, 1975 to the 19th day of July, 1975, and from the 27th day of July, 1975 to the 2nd day of August, 1975, all dates inclusive, except from half past ten o'clock in the forenoon to half past nine o'clock in the afternoon of Monday, from five o'clock in the forenoon to half past nine o'clock in the afternoon of Tuesday and from five o'clock in the forenoon to half past ten o'clock in the forenoon of Wednesday of each week; and

(c) From the 10th day of August, 1975 to the 16th day of August, 1975; from the 24th day of August, 1975 to the 30th day of August, 1975; from the 7th day of September, 1975 to the 13th day of September, 1975; and from the 21st day of September, 1975 to the 27th day of September, 1975, all dates inclusive, except from half past ten o'clock in the forenoon to nine o'clock in the afternoon of Monday, from five o'clock in the forenoon to nine o'clock in the afternoon of Tuesday and from five o'clock in the forenoon to half past ten o'clock in the forenoon of Wednesday of each week, and

(d) From the 17th day of August, 1975 to the 23rd day of August, 1975; from the 31st day of August, 1975 to the 6th day of September, 1975; and from the 14th day of September, 1975 to the 20th day of September, 1975, all dates inclusive, except from half past ten o'clock in the forenoon to nine o'clock in the afternoon of Sunday, from five o'clock in the forenoon to nine o'clock in the afternoon of Monday and from five o'clock in the forenoon to half past ten o'clock in the forenoon of Tuesday of each week.

(3) No person shall fish for sockeye or pink salmon with gill nets in the waters described in subsection (1) of this section:

(a) From the 6th day of July, 1975 to the 12th day of July, 1975; from the 20th day of July, 1975 to the 26th day of July, 1975; and from the 3rd day of August, 1975 to the 9th day of August, 1975, all dates inclusive, except from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday and from seven o'clock in the afternoon of Tuesday to half past nine o'clock in the forenoon of Wednesday of each week; and

(b) From the 13th day of July, 1975 to the 19th day of July, 1975, and from the 27th day of July, 1975 to the 2nd day of August, 1975, all dates inclusive, except from seven o'clock in the afternoon of Sunday to half past nine o'clock in the forenoon of Monday and from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday of each week; and

(c) From the 10th day of August, 1975 to the 16th day of August, 1975; from the 24th day of August, 1975 to the 30th day of August, 1975; from the 7th day of September, 1975 to the 13th day of September, 1975; and from the 21st day of September, 1975 to the 27th day of September, 1975, all dates inclusive, except from six o'clock in the afternoon of Sunday to nine o'clock in the forenoon of Monday and from six o'clock in the afternoon of Monday to nine o'clock in the forenoon of Tuesday of each week; and

(d) From the 17th day of August, 1975 to the 23rd day of August, 1975; from the 31st day of August, 1975 to the 6th day of September, 1975; and from the 14th day of September, 1975 to the 20th day of September, 1975, all dates inclusive, except from six o'clock in the afternoon of Monday to nine o'clock in the forenoon of Tuesday and from six o'clock in the afternoon of Tuesday to nine o'clock in the forenoon of Wednesday of each week.

4. (1) No person shall fish for sockeye or pink salmon with nets in that portion of the waters described in subsection (1) of section 3 lying easterly and inside of a fifteen fathom depth line, as measured at mean lower low water, projected from Partridge Point Light on Whidbey Island to the northwest corner of Deception Island to the Initiative 77 Marker on Fidalgo Island from the 6th day of July, 1975 to the 19th day of July, 1975, both dates inclusive.

(2) No person shall fish for sockeye or pink salmon with nets in that portion of the waters described in subsection (1) of section 3 lying southerly of a line projected from Dungeness Light to Smith Island Light to Lawson Reef Lighted Buoy to Northwest Island thence due east to Fidalgo Island from the 17th day of August, 1975 to the 13th day of September, 1975, both dates inclusive.

(3) No person shall fish for sockeye or pink salmon with nets in that portion of the waters described in subsection (1) of section 3 lying northerly and westerly of a straight line drawn from Iwersen's Dock on Point Roberts in the State of Washington to Georgina Point Light at the entrance to Active Pass in the Province of British Columbia from the 31st day of August, 1975 to the 6th day of September, 1975; and from the 28th day of September, 1975 to the 11th day of October, 1975, all dates inclusive.

(4) No person shall fish for sockeye or pink salmon with nets in that portion of the waters described in subsection (1) of section 3 lying westerly of a straight line drawn true south from the southeast tip of Point Roberts in the State of Washington (otherwise known as Lily Point) to the International Boundary from the 7th day of September, 1975 to the 27th day of September, 1975, both dates inclusive.

5. (1) The foregoing recommended regulations shall not apply to the following United States Convention Waters:

(a) State Fishing Area No. 7 including all Convention Waters known as Bellingham Bay lying inside of a line extending from Point Frances through Post Point Bell Buoy to the mainland, and

(b) That portion of State Fishing Area No. 3 lying easterly and inside of a line projected from Carter Point on Lummi Island to the most northerly tip of Vendovi Island, thence to Clark Point on Guemes Island including the waters of Samish Bay, and

(c) State Fishing Area No. 4, and

(d) Preserves previously established by the Director of Fisheries of the State of Washington for the protection of other species of food fish.

All times hereinbefore mentioned shall be Pacific Daylight Saving Time."

Emergency Orders

In order to provide for adequate racial escapement of Fraser River sockeye and pink salmon and for an equitable share of the season's catch by the fishermen of the United States and Canada, the approved regulations as detailed above were later adjusted by the Commission as follows:

June 12, 1975—At the request of the Director of the Washington State Department of Fisheries, the Commission approved the following change: that those waters of State Fishing Area No. 2 be closed to commercial trolling or hook and line fishing except from Monday through Friday of each week at those times when the net fishery is permitted to operate.

July 8, 1975—To provide additional harvest of the Early Stuart run, the Commission approved an additional 24 hours fishing in all United States Convention Waters for a total of three days fishing for the current week and an additional 24 hours fishing was granted in Areas 17, 18 and District No. 1 of Canadian Convention Waters commencing 8:00 a.m. July 9, making two days fishing for the current week.

July 29, 1975—To provide additional harvest of sockeye, the Commission extended fishing time in United States Convention Waters by 24 hours.

July 30, 1975—To provide further harvest of Chilko sockeye, the Commission approved an extension of 24 hours in United States Convention Waters, making a total of four days for the current week.

August 1, 1975—In order to secure sufficient escapement of Chilko River sockeye, the Commission approved closure of all United States Convention Waters until further notice.

August 5, 1975—In the interest of escapement of Chilko River sockeye, the Commission approved closure of all Canadian Convention Waters until further notice.

August 8, 1975—The Commission approved resumption of fishing as follows: 1. That Areas 17, 18 and District No. 1 of Canadian Convention Waters open at 3:00 p.m. August 10 for 65 hours fishing; 2. That United States Convention Waters open as originally scheduled for the week commencing August 10; 3. That Area 20 of Canadian Convention Waters open as originally scheduled for the week commencing August 10.

August 12, 1975—In the interest of division and additional harvest of sockeye, the Commission approved the following regulation changes: 1. That fishing in Areas 17, 18, 20 and District No. 1 of Canadian Convention Waters be extended by 24 hours; 2. That an additional 24 hours fishing be given in all United States Convention Waters commencing August 14, resulting in a total of three days for the week.

August 18, 1975—In the interest of division of catch and to provide adequate harvest of the late summer races, the Commission approved the following regulation changes: 1. That fishing in Area 20 of Canadian Convention Waters be extended by 24 hours; 2. That an additional 48 hours of fishing in Areas 17, 18 and District No. 1 of Canadian Convention Waters be allowed; 3. That fishing in all United States Convention Waters be extended 24 hours making a total of three days for the current week.

August 20, 1975—In the interest of division of catch and additional harvest, the Commission approved the following regulatory changes: 1. That fishing in Areas 17, 18 and District No. 1 of Canadian Convention Waters be extended 24 hours, giving a total of four days fishing for the current week; 2. That an additional 48 hours fishing time be allowed in Area 20 of Canadian Convention Waters, making a total of five days for the current week.

August 22, 1975—In the interest of division of catch, the Commission approved the following regulation changes: 1. That Areas 17, 18 and District No. 1 of Canadian Convention Waters be opened to fishing for the week commencing August 24 as originally scheduled but for 48 hours fishing instead of 24 hours as scheduled; 2. That there be a 24 hour delay in the scheduled opening of United States Convention Waters for the week commencing August 24, 1975.

August 26, 1975—In order to harvest additional pink salmon in Area 20 of Canadian Convention Waters, the Commission approved an extension of 24 hours fishing, making a total of three days for the current week.

August 29, 1975—The Commission delayed the scheduled openings for the week commencing August 31 by 24 hours in United States Convention Waters and Areas 17, 18 and District No. 1 of Canadian Convention Waters. Since no management problems were involved in this instance, the change was made to avoid a commercial fishery operation on Labour Day.

September 2, 1975—Due to an indicated decline in the pink salmon run, the Commission approved a reduction of 24 hours fishing in the United States Convention Waters to one day for the current week.

September 3, 1975—In the interest of division of catch and additional harvest of pink salmon, the Commission approved the following regulation changes: 1. That Area 20 of Canadian Convention Waters open at 7:00 a.m. September 5 for two days fishing; 2. That District No. 1 of Canadian Convention Waters westerly of the Apex Line open at 8:00 a.m. September 5 for 24 hours fishing; 3. That Canadian Convention Waters of Areas 17 and 18, except those portions easterly of the line from Reception Point to Thrasher Rock Light to Law Point on Gabriola Island, thence along the easterly shoreline of Gabriola Island to Josef Point, thence in a straight line to Cordero Point on Valdez Island and along the easterly shoreline of Valdez Island to Vernaci Point, thence in a straight line to Race Point on Galiano Island and along the easterly shoreline of Galiano Island to Burrill Point, thence in a straight line to Georgina Point on Mayne Island, thence along the easterly shoreline of Mayne Island to Campbell Point, thence in a straight line to Winter Point on Saturna Island, thence along the easterly shoreline of Saturna Island to East Point, thence due east in a straight line to the International Boundary, open for 24 hours fishing commencing 8:00 a.m. September 5.

September 5, 1975—In order to provide additional harvest of pink salmon, the Commission approved the following regulatory changes: 1. That fishing in Area 20 of Canadian Convention Waters be extended by 24 hours to 7:00 a.m. September 8 and closed thereafter until further notice; 2. That United States Convention Waters open as scheduled for the week commencing September 7 for one day fishing; 3. That the waters of District No. 1 and Areas 17 and 18 of Canadian Convention Waters open as scheduled with those waters of Areas 17 and 18 easterly of the Thrasher Rock-East Point Line (as described in Emergency Order of September 3) closed.

September 8, 1975—In the interest of division of catch, the Commission approved an additional 24 hours fishing in United States Convention Waters, making two days fishing for the current week.

September 12, 1975—In view of the declining abundance of pink salmon entering Convention Waters, the Commission approved the following regulation changes: That openings be advanced 24 hours for the week commencing September 14 in Area 20 of Canadian Convention Waters and United States Convention Waters; 2. That the scheduled opening in Areas 17, 18 and District No. 1 of Canadian Convention Waters be advanced 13 hours to 7:00 p.m. September 14 for 24 hours fishing with the waters of Areas 17 and 18 easterly of the Thrasher Rock-East Point Line remaining closed.

September 15, 1975—To provide additional harvest of late run Fraser pink salmon, the Commission approved a 24-hour extension of fishing in United States Convention Waters and Area 20 of Canadian Convention Waters, making a total of three days fishing in each area for the current week.

September 16, 1975—The Commission approved an additional 24 hours fishing time commencing 8:00 a.m. September 18 in District No. 1 of Canadian Convention Waters outside the Apex Line and in Areas 17 and 18 of Canadian Convention Waters, with the exception of those waters lying easterly of the Thrasher Rock-East Point Line, which would remain closed. The Commission relinquished regulatory control of Area 20 of Canadian Convention Waters and State Fishing Area No. 2 of United States Convention Waters, effective September 20.

September 19, 1975—In the interest of obtaining additional escapement of late run Fraser pink salmon, the Commission approved the following regulation changes: 1. That the scheduled opening in United States Convention Waters be delayed 24 hours; 2. That Areas 17, 18 and District No. 1 open as scheduled, with the waters of Areas 17 and 18 easterly of the Thrasher Rock-East Point Line remaining closed.

September 24, 1975—In the interest of division of catch, the Commission approved 24 hours additional fishing in District No. 1 of Canadian Convention Waters, outside the Apex Line, and in Areas 17 and 18 of Canadian Convention Waters, except those waters lying easterly of the Thrasher Rock-East Point Line, commencing September 25 at 7:00 p.m.

October 2, 1975—In the interest of obtaining additional harvest of sockeye and pink salmon, the Commission advanced the scheduled opening of October 6 in District No. 1 of Canadian Convention Waters to October 3 at 8:00 p.m. for 24 hours fishing. District No. 1 would not open for fishing on October 6.

October 7, 1975—Due to the declining abundance of pink salmon, the Commission relinquished regulatory control of the remaining Convention Waters still in the Commission's control effective Thursday, October 9, three days earlier than scheduled, thus completing the Commission's regulatory obligations for Convention Waters for the 1975 season.

SOCKEYE SALMON REPORT

The Fishery

The total 1975 Fraser River sockeye run was estimated at 3,678,000, compared with a preseason forecast of 5,500,000. It was the smallest run for the cycle since 1955 and was 4 million less than the brood year 1971. The number of Fraser sockeye accounted for entering Convention Waters was 3,471,000 of which 2,193,000 (63.2%) were caught commercially, 253,181 (7.3%) were taken by the Indian food fishery, and 1,010,448 (29.1%) were recorded on the spawning grounds (see Tables I to VI in Appendix). In addition, an estimated 15,000 Early Stuart sockeye died enroute to the spawning grounds in the Stuart area. Substantial numbers of sockeye taken by illegal fishing in the Fraser River above the commercial fishing boundary and/or taken during strike relief fishing but not reported, are not included in the above totals. The Commission is conducting an investigation of these unaccounted numbers, and will be reporting the findings when completed. An estimated 14,565 non-Fraser sockeye, mainly from the run to the Cedar River in Washington State, were also caught in Convention Waters. The estimated catches of Fraser River sockeye in non-Convention Waters in Johnstone Strait and northern Strait of Georgia, and coastal waters north of Convention Waters, were 112,000 and 95,000 respectively. The non-Convention Waters catch of Fraser sockeye migrating through Johnstone Strait was 3.0% of the total run, compared with 7.1% in 1971, the preceding cycle year. The month-long strike in Canada in 1975 affected the catch by Canadian fishermen in these non-Convention areas as well as in Convention Waters.

The total 1975 Convention Waters catch of 2,208,324 sockeye was below average for the cycle since 1951. Canadian fishermen caught 644,473 sockeye (29.18%) and United States fishermen caught 1,563,851 (70.82%) (Appendix Tables I and II).

Canadian fishermen were on strike from July 24 to August 22, the longest strike since the Commission started regulating the fishery in 1946. As shown in the following table, during the strike United States fishermen caught 1,147,694 sockeye in 10 days of fishing, whereas a much reduced Canadian fleet caught only 240,538 sockeye in seven scheduled days and six additional days of fishing. At the end of the strike, the sockeye run in United States Waters was practically over and for the remainder of the season, United States fishermen caught 70,572 sockeye compared with 210,832 for Canadian fishermen. The percentage division difference in favor of United States fishermen (70.8%) in 1975 was the second largest difference for either country from equal sharing during Commission regulatory control. (In 1947 Canada harvested 80.1% of the total landings in Convention Waters.) In addition, the actual number of fish involved in 1975 (919,378) was the largest numerical difference in the history of Commission regulations.

BEFORE, DURING, AND AFTER STRIKE CATCHES OF SOCKEYE

	CANADA		UNITED STATES	
	<i>Catch</i>	<i>Percent of Total</i>	<i>Catch</i>	<i>Percent of Total</i>
Before Strike	193,103	29.96	345,585	22.10
During Strike	240,538	37.32	1,147,694	73.39
After Strike	210,832	32.72	70,572	4.51
TOTAL	644,473	100.00	1,563,851	100.00

The catches in United States Convention Waters and in the Fraser River area of Canadian Convention Waters are shown in Figure 1. Also indicated are the catches that would have been made in the Fraser River area with a normal fleet of 500 to 700 gill nets. During the strike relief fishery, the number of boats ranged from as few as 19 up to approximately 200, resulting in smaller catches than could have been obtained. This applies especially to the peak of the Chilko and other summer races which migrated into the Fraser River early in August. The United States fishery was closed for 10 days during this period (an extraordinary measure during a strike) and the Canadian fishery was closed 5 days. When the fishing resumed on August 10 in Canada only 19 boats were fishing, and instead of an expected catch of about 105,000 sockeye, only 4,800 were caught. The next day, when the United States fishery opened, their catch was 156,000 sockeye. With a normal fishing fleet in the Fraser River area during the strike, the expected catch of sockeye would have totaled 580,000 fish, approximately 401,000 more than were estimated to have been caught. Out of a total season catch of 2,208,000 sockeye, only 281,000 were caught after the strike. Approxi-

mately 70 percent of the total sockeye runs passed through the net fishery areas during the strike, and because of lack of fishing effort by Canadian fishermen during this period, it was impossible for the Commission to divide the catch of sockeye equally.

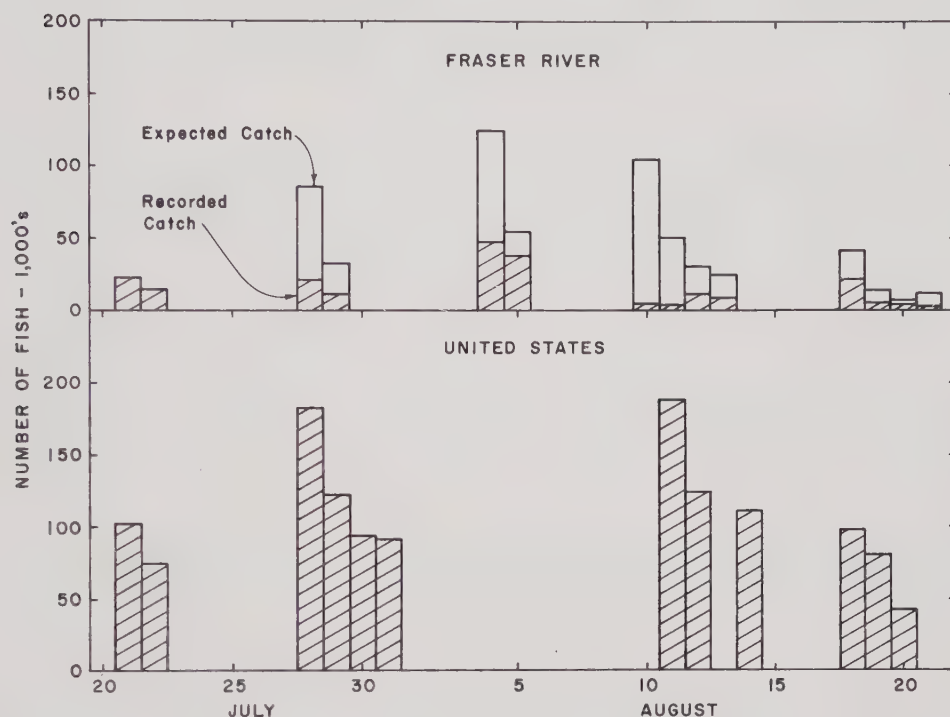


FIGURE 1. Commercial catches of sockeye in United States and Fraser River fisheries and expected catch in the Fraser River fishery for 1975.

The Early Stuart race continued to show improvement primarily as a result of conservation measures started in 1967. The 1975 run of about 460,000 fish was the largest run on record for the cycle and has increased dramatically from only 15,000 sockeye in 1963. The commercial catch of about 300,000 Early Stuart sockeye in 1975 had a value of approximately \$1,150,000 to fishermen compared with the low value accrued in 1963 from a commercial catch of only 8,000 Early Stuart sockeye.

Although the 1975 Chilko run was preceded in 1974 by exceptional numbers of jacks, the actual 1975 return of an estimated 825,000 fish was considerably below the preseason forecast of 1,800,000. Similarly, the numbers of jacks preceding the 1975 subdominant Adams run indicated that a run of about 1,000,000 adult sockeye would return, while the recorded run was about 600,000 fish.

In spite of the failure of some of the major races in 1975, other populations such as Early Stuart, Upper Pitt River and Weaver Creek had the largest returns ever recorded on the cycle and the run to Fennell Creek in the North Thompson District was the largest of any year on record.

In Canadian Convention Waters, only 114,138 sockeye were taken in the waters westerly of William Head while 530,335 were caught easterly of William Head, mainly near or in the Fraser River. The total catch in the western area was the lowest on the cycle since 1947* and in the eastern area, the lowest on the cycle since 1955. The total sockeye catch by Canada in Convention Waters was the lowest on the cycle since 1947. The purse seine catch (43,201) was the lowest number and percentage (6.7%) ever for the cycle year. Gill nets recorded the largest percentage (85.5%) share on the cycle since 1947.

In United States Convention Waters, the purse seine share of the percentage catch was similar to 1971. The gill net share, although only about 3 percent higher than in the brood year, was the largest percentage (39.4%) for the cycle. Reef net catch decreased in 1975 and was the lowest catch (51,096) on the cycle since 1947 and the lowest percentage (3.3%) for the cycle.

The amount of fishing effort in United States Waters reached a maximum of 232 purse seines and 902 gill nets in 1975. Although this was a reduction in effort compared with 1974 when 272 purse seines and 1,140 gill nets fished, the effort in 1975 still exceeded the brood year fishery when 166 purse seines and 650 gill nets fished during the sockeye season.

In Canadian Convention Waters, possibly influenced to some extent by the strike, the maximum number of fishing units in 1975 was considerably below that of 1971 and 1974, as shown below.

CANADIAN CONVENTION WATERS FISHING UNITS

<i>Year</i>	<i>Purse Seine</i>	<i>Gill Net</i>	<i>Total</i>
1971	173	1,357	1,530
1974	202	1,000	1,202
1975	116	842	958

The average weight of 4-year-old sockeye during the period July 7-August 20 was 5.58 pounds, below the 1915-1971 cyclic average for the same time period of 5.87 pounds.

Escapement

The net escapement of 1,010,448 sockeye represented 29.1% of the 1975 Fraser run to Convention Waters and 27.5% of the calculated total Fraser River run. Despite serious management problems encountered during the fishing season, the total escapement of sockeye arriving at the spawning grounds was near the preseason target of 950,000.

The net escapement of 85,499 Early Stuart sockeye, slightly below the brood year escapement of 95,942, would have been larger had there not been an unexplained loss of an estimated 15,000 sockeye that died in the Stuart River and in the Stuart Lake area just prior to arrival at the spawning areas.

The escapement of 29,700 spawners to the Bowron River system was slightly larger than in the brood year and the potential for future runs returning at a maximum on the 1975 cycle has been maintained.

Escapements of Early Nadina River sockeye continue to decline and the 1975 return of only 481 fish was less than one-half that recorded in the brood year. The Late Nadina escapement (15,319) increased slightly compared with the brood year and 11,306 of the total population spawned in the channel, the largest number to date. Production from the Stellako River race was encouraging and the escapement of 176,079 sockeye exceeded the brood year by 137,311 spawners. This escapement was the largest ever for the cycle and the largest in any year since 1946.

The adult escapement to Gates Creek was encouraging as it reflected an escapement about 4.7 times larger than in the brood year. Of the 1,982 adult escapement, 1,612 fish entered the spawning channel compared with only 282 adults in 1971.

The escapement to Upper Pitt River of 39,942 sockeye was the largest for the cycle since 1947 and the largest in any year since 1952. About 4,500,000 eggs were taken for eyeing in the hatchery, and this should ensure full utilization of the 4 million egg capacity of the incubation channel.

The escapements into most of the main summer run spawning areas were satisfactory and in general above the numbers recorded in the brood year. Seymour River, Middle River, Tachie River, Chilko River, Chilko Lake, Raft River and Fennell Creek all had good escapements, well above the brood year. A most noticeable increase occurred at Seymour River with 37,024 spawners, about twice that recorded in 1971. The 220,554 escapement to Chilko River was very close to the objective of 225,000 and the beach spawning population at the south end of Chilko Lake increased to 55,144, about 43,000 larger than in the brood year. The Raft and Fennell Creek escapements increased by about three times the brood year level and the Fennell Creek return of 4,127 fish was the largest escapement ever recorded. The Late Stuart escapement of 14,229 fish to Middle and Tachie Rivers was the largest on record for the cycle.

The Birkenhead River escapement of 92,928 fish was an increase of 60,650 fish compared with the brood year, reflecting the continued improvement in production for this race. The escapement was the largest on the cycle since 1947.

The Adams-Little River escapement of 155,471 sockeye was less than desired but was considered adequate for the subdominant cycle. The Lower Shuswap River population continues to build and the return of 11,652 spawners was about twice that of 1971 and was the largest on record for the cycle.

The Portage Creek escapement improved greatly for the second consecutive year following the drastic decline in 1970 and 1971. The 1975 return was 3,829 fish compared to only 281 in 1971. Passage of the run past the Seton Creek hydroelectric project was greatly improved during the first half of the run as a result of tests being conducted and this was partly responsible for the increased escapement.

Escapements in other late running spawning areas (Weaver Creek, Harrison River, Cultus) were above brood year levels with the most noticeable increase at Weaver Creek. The 1975 escapement of 32,011 fish was about six times larger than in 1971. In 1971 only 2,736 spawners utilized the spawning channel, whereas in 1975 a total of 19,816 sockeye spawned in the channel. In total, the channel accommodated 26,699 salmon of all species. The increase in production of sockeye at Weaver Creek is attributable to the spawning channel.

Success of spawning was good in all areas except at Early Stuart streams and Birkenhead River where only 79.2% and 53.7% respectively of the females spawned completely.

The Indian food fishery catch of 253,181 sockeye in the Fraser River and tributary streams was the largest on record exceeding the previous record established in 1974 by about 31,000 fish and was 100,000 sockeye greater than in 1971.

PINK SALMON REPORT

The Fishery

The total 1975 Fraser River pink salmon run was estimated to be 4,879,000 fish which was at the lower limit of the preseason prediction of a run between 5 and 6 million fish. The run was below the average of 6,233,000 fish recorded over the nine cycle returns from 1957 through 1973.

The marine survival of fry produced by the 1973 brood spawning was only 1.7% compared with the average of 3.1% recorded for the previous six cycles. The return was disappointing because the fry migration of 292,000,000 in the spring of 1974 was the largest since enumeration began in 1962, as shown in the following table, and at average survival rates the run would have exceeded 9,000,000. Because of unfavourable environmental factors when the fry left the Fraser River, survival rate was only about one-half the average. It was fortunate that the 1973 spawning produced an exceptional number of fry instead of the average production of 229,000,000 for the previous six cycles, since the increased production added about one million more fish to the total run than would otherwise have been obtained.

FRASER RIVER PINK SALMON PRODUCTION*

	<i>Brood Year</i>								
	1957	1959	1961	1963	1965	1967	1969	1971	1973
Total Spawners (millions)	2.425	1.078	1.094	1.953	1.191	1.831	1.529	1.804	1.754
Female Spawners (millions)	1.423	.596	.654	1.217	.692	1.015	.961	1.103	1.015
Potential Egg Deposition (billions)	2.8745	1.0847	1.5692	2.4348	1.4878	2.1321	2.0182	1.923	1.865
Fry Production (millions)	—	—	143.6	284.2	274.0	237.6	195.6	245.0	292.4
Adult Return (Catch + Escapement) (millions)	6.459	1.890	5.326	2.271	12.850	3.849	9.707	6.753	4.879
Freshwater Survival	—	—	9.2%	11.7%	18.4%	11.1%	9.7%	12.7%	15.7%
Marine Survival	—	—	3.7%	0.8%	4.7%	1.6%	5.0%	2.8%	1.7%

* Fry production data not available prior to 1961.

The total number of pink salmon entering Convention Waters in 1975 was estimated to be 4,363,000 fish as shown in the following table, considerably less than the 6,912,000 recorded in the brood year. Fraser River pink salmon formed 83.7% of the total pink salmon run reaching Convention Waters, compared to 79.8% in 1973. The harvest of 147,529 United States pink salmon in Convention

CALCULATED CATCHES AND PERCENTAGE HARVEST FROM PINK SALMON RUNS ENTERING CONVENTION WATERS IN 1975

	<i>Source of Run</i>			
	<i>United States</i>	<i>Fraser River</i>	<i>Canada Non-Fraser</i>	<i>Total</i>
Total Entering Convention Area	519,878	3,650,609	192,867	4,363,354
Catch in Canada Convention Waters				
Westerly of William Head	109,050	741,795	16,097	866,942
Easterly of William Head	—	405,874	758	406,632
Total	109,050	1,147,669	16,855	1,273,574
Percent Harvest	20.98	31.44		
Catch in United States Convention Waters	38,479	1,094,189	120,487	1,253,155
Percent Harvest	7.40	29.97		
Total Catch in Convention Area	147,529	2,241,858	137,342	2,526,729
Percent Harvest	28.38	61.41		

Waters constituted only 28.4% of the United States run to Convention Waters, whereas 61.4% of the Fraser run to Convention Waters was harvested in the fishery. The harvest of the United States pink salmon stocks was minimized by regulatory action at the request of the State of Washington, since escapement requirements exceeded the expected total return of these stocks.

The 1975 catch in Convention Waters was 2,509,045 compared with 4,285,603 in brood year 1973 (Table XI). The division of catch was Canada 1,255,890 pinks (50.05%) and the United States 1,253,155 (49.95%). At the end of the strike by Canadian fishermen, United States fishermen had taken 297,897 pink salmon, whereas Canadian fishermen had caught only 176,855. The difference in catch was easily corrected during the remainder of the season as only 18.9% of the total season's catch had been made by the time the strike had ended. The later timing of the pink run provided ample time to reach equal division of catch for the season.

The proportion of the catch of pink salmon in United States Convention Waters by the various fishing gears was similar to other recent cycle years (Table X). Although the gill net percentage catch of 15.70% was only about 1% higher than in the brood year, it was the highest of any year on record. In Canadian Convention Waters the percentage catch by purse seines decreased about 10% from 1973, and the percentage catch by gill nets increased nearly 11% from 1973.

In 1975, 74.8% of the total Fraser pink run reached Convention Waters, compared with 81.7% in brood year 1973. From an analysis of the catches of Fraser pink salmon made in Juan de Fuca and Johnstone Straits, it appears that the run approached the mouth of the Fraser River in a normal manner from the two migratory paths.

Escapement

The total 1975 escapement of pink salmon to the Fraser River was 1,367,263 fish (Table XIV) or about 28.0% of the total run. The escapement in 1975 was about 400,000 fish lower than the preseason goal of 1,750,000 which was at about the same level as the brood year. It has been pointed out in the Commission's 1971 Annual Report that with proper distribution of spawners the total Fraser River pink salmon spawning areas could accommodate about five times more spawners than were obtained in 1975. The much larger potential for increased pink salmon production will not be realized until either the escapement level is increased substantially or artificial aids are provided to increase fry production.

The early run escapement was satisfactory in the areas above Hell's Gate with the Thompson River and its tributaries receiving the largest escapement on record, 480,350 fish. The return was about a 70% increase over the brood year. This system could take substantially greater numbers of spawners based on available spawning area. The total return to the Seton Creek area of 241,603 pink salmon was larger than in the brood year and exceeded the optimum number of spawners for the area. The two spawning channels were filled to capacity. A very

significant increase in escapement has taken place at Portage Creek in the last two cycles, and the 28,454 spawners in 1975 was the largest recorded under Commission management. The total escapement above Hell's Gate was 761,210 pink salmon, the largest on record since the completion of the Hell's Gate fishways in 1945 and about 230,000 fish larger than in the brood year.

The early run escapement of only 315,049 pink salmon into the main Fraser River below Hell's Gate was totally unexpected and represented the lowest escapement since the Commission assumed management of Fraser pinks in 1957. The return in 1975 was 202,000 fewer fish than the previous lowest escapement of 517,000 spawners recorded in 1963. There was no indication that fry production of main Fraser spawners in the spring of 1974 was deficient and in view of increased escapements to Seton Creek and Thompson Rivers, a much larger return was anticipated. The unusual distribution of the early run spawners in 1975 illustrates a problem that could be a major concern with much larger escapements. The total early run escapement of 1,088,341 fish was considerably below that of the last four cycle returns and the lowest since 1965.

The total late run escapement of 278,922 pink salmon was a 34.1% reduction compared with the brood year. The Harrison River escapement of 180,052 spawners approached the brood year escapement of 196,150 fish and is considered a satisfactory number. The escapement to the Chilliwack-Vedder River system of only 81,137 pink salmon was the lowest on record and was about 130,000 fish lower than in the brood year. As noted in the 1973 Annual Report, both the Chehalis and Chilliwack-Vedder Rivers encountered severe floods during the fall of 1973 and escapements to both areas in 1975 showed the effects of the floods. Unfortunately, extreme flooding occurred again during the fall and winter of 1975 and special fishery protection will most likely be needed in 1977 to rehabilitate the late run escapements. Water levels during peak spawning periods for the main Fraser, Seton Creek and Thompson River runs were satisfactory and the flood conditions experienced in the late run areas did not occur in the spawning areas above Hell's Gate.

Spawning Channel Operations

Fry production data for the 1974 spawning of sockeye at channels operated by the Commission are given in the following table. At each channel, the number of fry produced is determined from a 5 percent sampler.

FRY PRODUCTION AT SPAWNING AND INCUBATION CHANNELS
FROM THE 1974 BROOD YEAR SPAWNING

<i>Site</i>	<i>Species</i>	<i>Eggs Deposited</i>	<i>Fry Produced</i>	<i>Percent Survival</i>
Weaver Creek	Sockeye	59,928,000	36,850,000	61.5
Gates Creek	Sockeye	122,000	82,000	67.2
Upper Pitt	Sockeye	3,437,000	2,622,000	76.3
Nadina River	Sockeye	1,397,000	1,001,000	71.6

The sockeye fry production from the Weaver Creek channel was the largest in the ten years of operation of the channel, and was 4.5 times more than from the previous cycle brood. The number of fry was also about 1.8 million more than

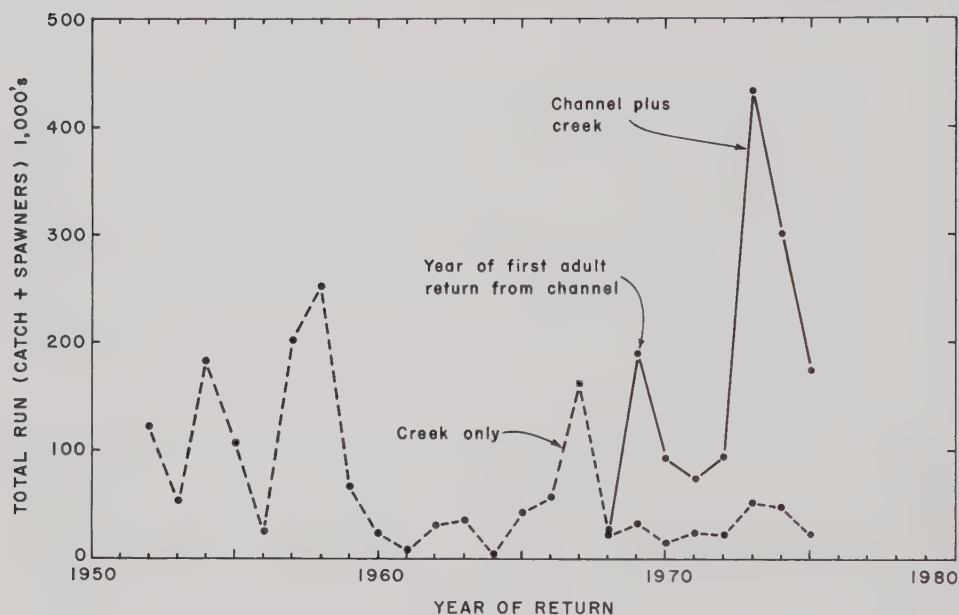


FIGURE 2. Sockeye production from Weaver Creek and Weaver Creek channel.

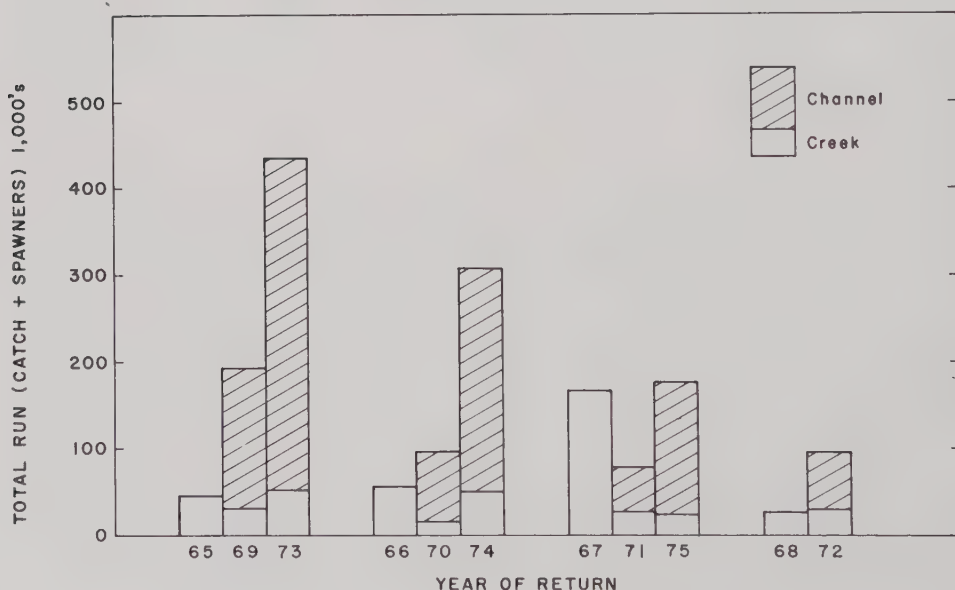


FIGURE 3. Number of adult sockeye produced from spawning in Weaver Creek spawning channel compared to the number produced by natural spawning in the creek, by cycle years.

from the 1973 spawning, indicating that maximum fry output capability has not been reached yet. A further incremental increase in spawners above the 24,664 sockeye that spawned in the channel in 1974 appears justified. The total adult return in 1975 was approximately 175,000 sockeye, of which 152,000 were produced by the channel (Figure 2). The total run was more than twice the 79,200 run in the previous cycle year 1971. Production of sockeye from the channel is increasing on all four cycles (Figure 3). The 1975 cycle started with 2,861 spawners in the channel in 1967, compared with 4,403 and 6,129 spawners in the 1965 and 1966 cycles respectively, and consequently has not reached the size of the other two cycles yet. However, the channel had 18,433 spawners in 1975, about three-quarters of the design capacity, and the potential for the run in 1979 is good. As shown in the following table, total fry production from the channel has been 5.5 times greater than from the creek, from only 63 percent as many eggs. The channel has produced 83 percent of the catch of Weaver Creek sockeye in the years 1969-75.

WEAVER CREEK SOCKEYE FRY PRODUCTION
1965-74 BROOD YEARS

	<i>Creek</i>	<i>Channel</i>
Eggs Deposited, millions	344.2	217.1
Fry Produced, millions	28.7	158.1
Average Survival, percent	12.0	72.8

Production of 4-year-old returns in 1975 from the 1971 brood was approximately 4.88 per 1,000 eggs in the creek and 24.74 per 1,000 eggs in the channel, slightly larger than last year and well above average as shown in the following table.

AVERAGE RETURN PER 1,000 EGGS POTENTIAL DEPOSITION
WEAVER CREEK RUN

<i>Brood Years</i>	<i>Weaver Creek</i>	<i>Weaver Channel</i>
1948-64	2.19	Not in Operation
1965-71	1.24	13.30

The commercial catch of sockeye produced by the channel to 1975 is valued at \$4,356,000 to the fishermen, and this was produced from a total operating and capital recovery cost of \$360,000 for the 7 brood years.

Egg-to-fry survival at the Gates Creek channel from the few spawners in 1974 was good. Fry production from the channel since it started operation has totaled about twelve times more than from the creek from about twice as many eggs, as shown in the following table.

GATES CREEK PRODUCTION
1968-74 BROOD YEARS

	<i>Creek</i>	<i>Channel</i>
Eggs Deposited, millions	7.74	16.56
Fry Produced, millions	1.20	14.87
Average Survival, percent	15.5	89.8

Four years of adult returns have now been obtained at the Gates Creek channel. The total adult run in 1975 was 10,700 sockeye, which is a return of about 38 fish per 1,000 eggs deposited. The returns produced by the channel per 1,000 eggs deposited have averaged about six times greater than from the creek, as shown in the following table.

AVERAGE RETURN PER 1,000 EGGS POTENTIAL DEPOSITION
GATES CREEK RUN

<i>Brood Years</i>	<i>Gates Creek</i>	<i>Gates Channel</i>
1952-67	3.53	Not in Operation
1968-71	1.73	9.98

The average rate of return is established primarily by the dominant cycle run (1968-72). In the return years 1972-75, the Gates Creek sockeye run has produced a total catch of 78,000 sockeye, and 91.5% of this catch (71,500 sockeye) was produced by the channel. The value of these catches to fishermen has been \$230,000 and the cost of operation and capital recovery has been \$187,000 for the four brood years. A number of factors have contributed to the low benefit-cost ratio for this initial four-year period. The major factor is that the number of spawners available has been only about one-third of the design capacity of the channel. Other factors are the silt accumulation in the channel in 1969, and effects of the Seton Creek hydroelectric plant on smolts and adults, and apparent losses of fry during the migration through Anderson Lake to Seton Lake.

The 1975 run of Pitt River sockeye totaled 146,100 fish, and was the second largest since 1948 (Figure 4). The incubation channel produced 37.5% of this run. This channel has an area of only 717 sq yds, with a capacity of 4 million eggs, compared to an area of several hundred thousand sq yds in the Pitt River, yet in the twelve brood years 1963 to 1974 it has produced 32 million fry, compared to 36 million produced by the natural spawning ground. As shown in the following table, the channel has been over seven times more effective than the river in terms of survival from eggs to fry.

UPPER PITT RIVER SOCKEYE FRY PRODUCTION
1963-74 BROOD YEARS

	<i>River</i>	<i>Channel</i>
Eggs Deposited, millions	329.6	39.6
Fry Produced, millions	36.1	32.0
Average Survival, percent	11.0	80.8

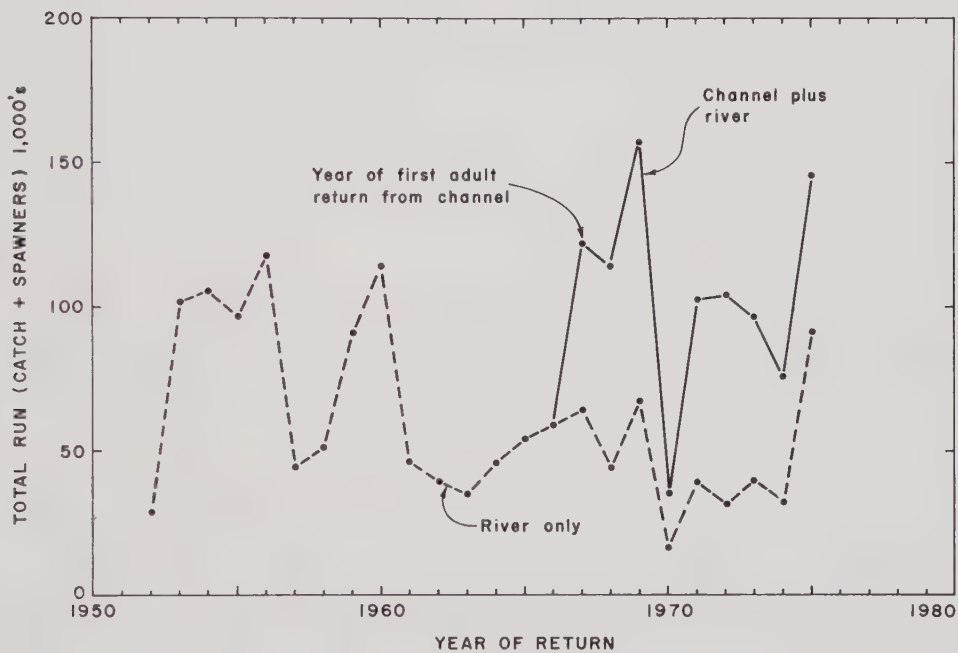


FIGURE 4. Sockeye production from Pitt River and Pitt River incubation channel.

The channel has produced returns of 525,000 sockeye in the years 1967-75, compared to 486,000 sockeye produced by the river. The average return per 1,000 eggs in the channel has been almost 12 times greater than from eggs in the river, as shown in the following table.

AVERAGE RETURN PER 1,000 EGGS POTENTIAL DEPOSITION
UPPER PITT RIVER RUN

<i>Brood Years</i>	<i>River</i>	<i>Channel</i>
1948-62	1.31	Not in Operation
1963-70	1.54	18.01

The channel has produced a total catch of 433,000 sockeye in the years 1967 to 1975 with a value of \$1,791,000 to fishermen. This benefit was produced for a total operating and capital recovery cost of \$202,000 for the nine brood years.

The spawning channel for the Late Nadina sockeye run has completed two winters of operation in air temperatures as low as -38°F without any problems. Egg-to-fry survival has been high in both years, averaging 73%. The number of spawners in the channel in 1975 increased to 11,306, or about 39% of the design capacity. Most of the fish entered the channel by the main entrance fishway but 3,020 were captured by seining and were carried into the channel.

The comparative rates of return from the channels and the natural spawning areas for the Weaver, Gates and Pitt River stocks demonstrate the advantage of the spawning and incubation channels for each of these stocks where deterioration of the natural spawning grounds has been a factor in lowering the returns from these grounds. However, the rates of return from the channels are also substantially greater than obtained from good spawning grounds such as the Adams-Little River-Shuswap and the Chilko. For example, average rate of return for the Pitt River channel from the brood years 1963-71 has been 17.37 adult sockeye per 1,000 eggs, whereas the average rate of return from the Adams and Chilko runs for the same period has been respectively 1.82 and 4.18 adult sockeye per 1,000 eggs. At the Weaver Creek channel, the average rate of return for the brood years 1965-71 has been 13.30 adult sockeye per 1,000 eggs, whereas for these same brood years the returns from the Adams and Chilko runs averaged respectively 1.53 and 3.87 adult sockeye per 1,000 eggs.

The two spawning channels for pink salmon at Seton Creek were filled to capacity, with 7,995 spawners in the upper channel and 23,874 spawners in the lower channel. A substantial amount of fine material has accumulated in this channel since it started operation in 1961, much of it being broken pieces of stone from the gravel, which needs to be removed. There is not sufficient water velocity in the channel to use the spawning channel gravel cleaner for this purpose, as the stone pieces do not get carried away. Other means will have to be used to clean the gravel before the next spawning in 1977.

REHABILITATION

The scope of work in rehabilitation has been limited because of the lack of agreement between the two countries on funding of the Commission's development program. This program recommended facilities which would restore sockeye production to historical levels, approximately three times current average production, and which would double the current production of pink salmon, thereby enabling greater escapements to expand the present stocks.

Progress of the 1972 transplant of sockeye eggs to the Lower Horsefly River remains uncertain. The spawning grounds were surveyed for returns of three-year-old jacks in the fall of 1975 and none were found. The transplant consisted

of Stellako eggs fertilized with Horsefly jack males, and since Stellako sockeye frequently produce very few jacks, the lack of jacks at Horsefly in 1975 is not necessarily significant.

The 1974 report presented details of a transplant of Seymour River sockeye eggs to the Upper Adams River to try to re-establish the once large run to this river. In the spring of 1975 observations were made in Adams Lake near the mouth of Upper Adams River but no sockeye fry were seen. However, observation was difficult because of turbid water during the spring freshet. An acoustic survey was made of Adams Lake in October of 1975, but because of the very large population of kokanee, estimated to be in excess of 10 million, it was not possible to determine the abundance of sockeye. An attempt will be made in the spring of 1976 to enumerate the sockeye smolt emigration from Adams Lake. A second transplant to the Upper Adams River was made in August 1975, consisting of 2,187,313 Seymour River sockeye eggs. These were flown to the Upper Adams and were incubated in trays until eyed. At the end of October 2,140,000 eggs were planted in the river.

RESEARCH

The rearing of pink salmon from the 1973 Seton Creek brood to produce even year adults in 1976 continued during 1975 using the stock being held in fresh water at the Sweltzer Creek Research Laboratory. The stock being reared in sea water at Bamfield all died from vibrio in February and this phase of the program was suspended. After further investigation of the probabilities of success with a repetition of the test using the 1975 brood, in conjunction with the additional costs for use of the facilities, it was decided to terminate the work at Bamfield. The remaining 60 fish were transferred to the Sweltzer Creek Laboratory in February 1975, and they were put on a natural light cycle and increased food ration to try and have them mature in the fall of 1975. Nineteen of these fish remained at the end of 1975, weighing between one and two pounds, but only two had matured by December.

At the end of 1975 there were approximately 1,400 pinks remaining in the group that was being reared at the laboratory. These weighed approximately 70 gm and were 20 cm long. Following appearance of symptoms attributed to the commercial diet preparation, the fish were placed on a ration of marine zooplankton which has corrected the problem. Losses average 3 to 4 fish per day primarily due to kidney disease, for which there is no proven treatment. Periodic salt baths have been beneficial in controlling fungus. The original objective of the program was to have 1,500 mature fish in the fall of 1976, but it is now obvious that less than this number will survive. The eggs produced by the mature fish will be planted in the Seton Creek spawning channel, with the objective of producing a return of adults in 1978.

Research on rearing of sockeye has been suspended temporarily pending results of the 1974 release of smolts from the laboratory. There was no evidence of return of these fish to Cultus Lake as three-year-old jacks in the fall of 1975,

but this also occurred with the 1972 release, which subsequently had an excellent return as adults. The 1972 and 1974 groups of fish released were the only two that did not experience a problem with IHN infection.

Infectious hematopoietic necrosis (IHN) previously has been a problem with hatchery rearing of sockeye, but was not regarded as a problem in natural populations. The occurrence of IHN was confirmed in Chilko sockeye fry in 1973 as reported in the 1974 Annual Report. During 1975 all major sockeye spawning grounds in the Fraser River system were surveyed for presence of IHN virus. Samples of ovarian fluid were collected, frozen and shipped to the Fisheries Research Board Laboratory in Nanaimo for testing. Samples from 5 females were pooled, and between 16 and 24 pooled samples were collected from each stock tested. As shown in the following table, IHN was detected in all stocks sampled with the exception of Adams and Stellako. Bowron River, Forfar Creek and Nadina River all had a very high incidence of carriers of IHN.

PREVALENCE OF IHN IN OVARIAN FLUIDS OF SOCKEYE SALMON
COLLECTED IN THE FRASER RIVER WATERSHED 1975

<i>Population</i>	<i>Number of Pools</i>	<i>Percent Positive for IHN</i>
Adams	20	0
Birkenhead	20	5
Bowron	20	80
Chilko	20	35
Cultus	23	4
Forfar Creek (Stuart)	24	100
Gates Creek	20	5
Nadina River	21	100
Seymour	16	6
Stellako	20	0
Weaver	21	29

Since the technology for detection of IHN has advanced since the survey made by the Commission in 1968, when none was found, it is not known if the results of the 1975 survey indicate a change. Other recent surveys have found IHN in sockeye in streams in Alaska, British Columbia, Washington and Oregon (Grischkowsky and Amend, MS). In cooperation with the Western Fish Disease Laboratory in Seattle, a vaccine for IHN was tested in Cultus Lake and Weaver Creek sockeye fry, but was not successful.

Significant prespawning mortality occurred in two areas in 1975. The success of spawning for the Early Stuart runs was 79% for the 85,000 sockeye that reached the spawning grounds. An estimated 15,000 sockeye died in the Stuart

River system before reaching the spawning grounds, and if these are included, the prespawning loss would be approximately 33%. The largest loss previously recorded was 28.5% in 1961. The peak of the 1975 Early Stuart run was July 4 at New Westminster, about 3 days earlier than average in timing and one of the earliest runs on record. Water temperature at Hell's Gate during the peak of the migration was approximately 63°F. The peak of the 1961 run was July 10 at New Westminster, two days later than average, but water temperatures at Hell's Gate were approximately 65°F during the peak of migration. Thus, as was the case with the Horsefly sockeye run, as reported in the 1973 Annual Report, timing of the run and temperatures in the Fraser during the upriver migration appear to be factors which are related to prespawning loss.

The success of spawning for the Birkenhead run was 53.7%, the lowest ever recorded. The previous low was 62.9% in 1969, but success of spawning less than 70% has occurred five times in the last 24 years. No explanation for these losses has been found yet.

The intensive study of the Horsefly River sockeye run in 1973 has indicated some potential causes of prespawning mortality for that race, but the reasons for the loss are still not understood.

The comprehensive study of the 1974 brood Adams River sockeye continued during 1975. Intensive hydraulic sampling of the spawning grounds in Adams River, Little River, and Lower Shuswap River was carried out to determine numbers of eggs deposited and survival of eggs. Preliminary analysis indicates substantial difference between the theoretical egg deposition and the number found during the survey, which may indicate many eggs were not retained in the gravel. A high survival rate was indicated for the eggs found.

Sockeye fry emerging from Adams and Little Rivers were enumerated by a mark-recapture method as they entered Shuswap and Little Shuswap Lakes. An estimated 301 million fry migrated from the Adams River. Approximately 32 million of these fry went down Little River into Little Shuswap Lake and an additional 45 million fry from Little River spawning went into Little Shuswap Lake. These data indicate an egg-to-fry survival of 15% for both Adams and Little River, which is considered good. Total fry entering Big Shuswap Lake, Little Shuswap Lake and Mara Lake (from the large escapement into Lower Shuswap River) in the spring of 1975 was estimated at 412 million.

A study of predation on the fry was carried out in Shuswap Lake from April 22 to July 15 under permit from the Fish and Wildlife Branch, British Columbia Department of Recreation and Conservation. Gill nets were fished at seven locations along the south shore of the lake east of the mouth of Adams River to catch potential onshore predators. A total of 787 fish were captured comprising, in order of fry abundance in their stomachs, 17 rainbow trout, 31 ling, 12 Dolly Varden, 25 lake trout, 45 lake whitefish, 191 squawfish, 93 Mountain whitefish, 3 chinook smolts, 237 Peamouth chub, and 133 suckers. The rainbow, ling and

Dolly Varden stomachs had far more fry than all the other predators caught averaging respectively 68, 35 and 26 fry per stomach examined. They also appeared to be feeding predominantly on sockeye fry, whereas in the other species except the chinook smolts, the stomachs contained more other fish and invertebrates. Chub stomachs contained mostly invertebrates.

A significant difference was observed in the feeding habits of predatory fishes in the present study compared with investigations carried out in the 1950's for the year following spawning of the dominant Adams River sockeye run. Ward and Larkin (1964)* found that about 70% to 75% of the total volume of food contained in the stomachs of rainbow trout taken at the west end of Big Shuswap Lake (near Adams River) in the spring and summers of 1955 and 1959 was composed of sockeye eggs. In extreme contrast, during the 1975 study, eggs were found in only one Mountain whitefish stomach and none in the rainbow trout that were captured.

The migration of the sockeye fry along the shores of Shuswap Lake was monitored by echo sounder, and later when the fry spread out over the lake, an estimate of the population size was obtained by acoustic surveys coupled with trawling to identify the species of fish. In October, the Fisheries Research Institute, University of Washington, under contract to the Commission, made its fifth acoustic survey of Shuswap Lake. The indicated survival rate from fry to fingerlings (in October) was under 14% compared with an average of around 50% survival at Chilko Lake where there are fewer predators. Production of fingerlings per spawner for the 1974 brood year was higher than in cycle year 1970, which is encouraging.

Acoustic surveys of fish populations in all the major lakes in the watershed were done at least once this year. The surveys are done each year even though the number of sockeye expected in some lakes may be very low. Estimates of fish populations in years of low sockeye abundance provide an indication of numbers of resident fish competing with sockeye for food. In many lakes in the Fraser River watershed in the interior of British Columbia, the major competitor is kokanee. In most of these lakes the populations of kokanee are relatively small in comparison with the sockeye populations of the dominant year classes. However, in Adams Lake where there are now very few sockeye, the kokanee population is larger than in Shuswap Lake. It appears that competition from sockeye may tend to lower kokanee populations. In lakes of the lower Fraser where there are few kokanee, other species are present which may compete with sockeye. In Pitt Lake and Harrison Lake there are very large populations of longfin smelt (*Spirinchus thaleichthys*), which feed on the same organisms as sockeye. In spite of the presence of these smelt, sockeye from the large populations produced at Weaver Creek and Birkenhead River recently have grown very well in Harrison Lake and the sockeye have grown well in Pitt Lake. The Commission will be placing more emphasis on this program in future, using improved acoustic equip-

* Ward, F. J. and P. A. Larkin, 1964. Cyclic Dominance in Adams River Sockeye Salmon. Int. Pac. Salmon Fish. Comm. Prog. Rept. 11.

ment now available, with the objective of obtaining estimates of sockeye smolt production from all the major producing areas. At present, practical considerations limit the collection of this information to Chilko Lake and Cultus Lake.

One of the major factors affecting the growth and survival of sockeye fry is the abundance of zooplankton in the lakes. Measurements of zooplankton volume have been conducted for many years and these data, combined with the recorded growth of the smolts, have provided information for assessing total possible fry rearing capacities of the lakes.

From periodic monitoring of the abundance and species composition of plankters in the lakes we are able to assess the status of the food supply available to the young sockeye. Zooplankton abundance in Shuswap Lake appears to have stabilized in 1974 and 1975 at levels comparable to 1954 and 1975. In spite of the large increase in numbers of fry utilizing Harrison Lake as a result of the output from the Weaver Creek spawning channel and fry from increased Birkenhead River escapements, the size of smolts produced in the lake continues to be large, suggesting that the upper limit of fry rearing potential has yet to be reached.

In the 1973 Annual Report, a hypothesis was presented which offered prospect of increased reliability of forecast of the marine survival of pink salmon. The four factors involved during the 1974 fry emigration indicated a survival of 1.98 percent for the 1975 return. As reported, the actual survival was 1.67 percent. This makes seven consecutive cycles that the survival predicted from the four factors came within 0.3 percent of the actual survival. Since 0.3 percent of 300 million fry represents almost one million adults, investigations have been continuing to improve understanding of the factors influencing marine survival of pink salmon. In addition to the factors mentioned in previous annual reports, a large number of biological and physical variables previously measured in Georgia Strait and the Pacific Ocean were examined in detail and the relationship of all variables to pink salmon marine survival were studied. The most useful of these variables appear to be environmental factors during the summer of the fry migration.

Similar variables have been examined in the study of the marine biology of Fraser sockeye but in this case the most useful factor appears to be the scale growth of Fraser sockeye in the first marine year. Two relationships of practical interest have emerged from a detailed examination of the scale data available since 1950. First, the correlation coefficient between the scale growth and marine survival of Chilko sockeye is strongly positive for the odd-numbered brood cycles, strongly negative for one even-numbered brood cycle, and weakly negative for the other. Second, the scale growths of 4₂ sockeye of the Adams race are highly and positively correlated with the Chilko race for the years in which Adams River smolts of the dominant and subdominant population form a large proportion of the total number of smolts leaving the Fraser River. In the other cycle years this relationship is much weaker. This information should improve the prediction of the marine survival of Chilko and Adams sockeye for at least two of the four cycle years.

ENVIRONMENT PROTECTION

Progress continued during 1975 in improvements to the waste treatment procedures at the pulp mills now operating in the Fraser River system. An aerated lagoon to provide 5-day treatment of all effluents at the Northwood Pulp and Timber Company Limited mill at Prince George started operation in late 1974. Effluent from the new aerated lagoon is passed through the original aerated treatment pond which adds about 19 hours of treatment. Although start-up of the new aerated lagoon occurred under winter conditions, the treatment met detoxification standards during 1975.

The project to upgrade treatment at Prince George Pulp and Paper Company Limited and Intercontinental Pulp Company Limited progressed into the first phase which included clarifiers to remove settleable solids from selected wastes. The clarifiers are expected to be operational in 1976. The second phase, which would provide an aerated lagoon to treat combined effluent from the two mills has been delayed for a number of reasons but planning is continuing.

In the 1974 Annual Report it was mentioned that a project was underway in cooperation with the Pacific Environment Institute to describe the constituents, toxicity and detoxification of foam on aerated lagoons at two bleached kraft pulp mills on the Fraser River watershed. Bioassays established that the foam was toxic to juvenile sockeye salmon at concentrations about 3 orders of magnitude less than untreated effluent. Chemical fractionation of one foam revealed toxicity was caused primarily by resin acids and secondarily by neutral compounds related structurally to resin acids. The major toxic constituent in foam from the second aerated lagoon was a non-ionic surfactant pitch dispersant. Remaining toxicity in the second foam was related to non-neutral compounds not identified in the study.

Foams were not readily detoxified by biological treatment under laboratory conditions, therefore they may contribute to substandard detoxification of effluent. On the other hand, foam serves a useful role as an insulating blanket against cold weather, maintaining temperatures necessary for biological treatment. However, it would be desirable to reduce the supply of toxic constituents to foam as much as possible.

At the present level of technology, resin acids and related compounds normally occur in pulp mill effluents. However, excessive discharges of resin acids are subject to control through the liquor and soap recovery processes. If washers, evaporators, soap recovery systems or other processes and spill control facilities are less than adequate, excessive amounts of resin acids may enter the sewer system. Substances such as pitch dispersants are added during the pulp manufacturing process to assist production and maintain quality of product. As an alternative, non-toxic pitch control products or substances readily degraded in an aerated lagoon were recommended.

Details of the foam study were presented at the 1975 Environment Improvement Conference sponsored by the Technical Section of the Canadian Pulp and Paper Association. Commission staff also participated in deliberations of the toxicity subcommittee of the government-industry Pulp and Paper Task Force which is reviewing federal effluent regulations and guidelines.

A federal-provincial task force completed studies of color, foaming and algal growths in the Thompson River and Kamloops Lake. As described in the 1974 Annual Report, the Commission obtained measurements of macroinvertebrate populations and egg-to-fry survival of 1973 brood pink salmon for the task force report. The task force report identified phosphorous as a key factor in causing high productivity of benthic algae growths. The Weyerhaeuser Canada Limited pulp mill and City of Kamloops municipal sewage were cited as the major point sources of phosphorous. As a result of the investigation, phosphorous was not added to the aerated lagoon at the pulp mill during 1975 and nitrogen additions were eventually stopped. Detoxification continued in spite of removal of these nutrient sources indicating that other sources within the mill met the needs of the aerated lagoon. However, the minimum nutrient supply commensurate with satisfactory treatment in an aerated lagoon has not been defined as discussed in the 1974 Annual Report.

Phosphorous is to be removed from Kamloops municipal sewage by applying chemicals during treatment in the lagoons now used by the city.

Effluent from the pulp mill at Kamloops was cited as the cause of the darker color of the Thompson River downstream of Kamloops Lake when compared to the river upstream of the pulp mill. However, the task force did not attempt to evaluate the effect of color on biota in Kamloops Lake or the Thompson River and cited the basic effect as deterioration of aesthetic quality.

The number of pink salmon spawners in the Thompson River increased from about 283,000 in 1973 to approximately 480,000 in 1975, even though the total run of pink salmon to the Fraser River systems was less in 1975 than in 1973. The pulp mill at Kamloops was not operating from early July to mid-October and during this time color of the river changed noticeably toward its original greenish hue. When pink salmon spawned in October, benthic algal growths appeared normal and condition seemed satisfactory for spawning.

The 1974 Annual Report mentioned that problems of sewage disposal were presented by a proposal to expand a ski development upstream of Weaver Creek spawning channel. As a consequence of an appeal and hearing on the subject before the Pollution Control Board, the plan was revised so that treated sewage will be directed to a less sensitive watercourse outside the Weaver Creek drainage.

The Annacis Island sewage treatment plant began operation in 1975 at a dry weather flow of about 50 cfs as the first trunk sewers were connected to the collection system. Sewage flow to the plant will increase as more trunk sewers

are connected and as population and industry increase in the collection district. It is forecast the dry weather flows will increase to approximately 100 and 240 cfs in 1986 and 2021, respectively. Sewage receives primary treatment consisting of sedimentation to remove settleable solids, disinfection by chlorination and dechlorination to remove toxicity induced by chlorination. Effluent from the plant is discharged to the Fraser River through diffusers on the river bottom. Dechlorination using sulfur dioxide was tested at the Lulu Island treatment plant in a cooperative project with Greater Vancouver Sewerage and Drainage District, Canada Department of Environment and the Commission.

The 1974 Annual Report noted that the Greater Vancouver Regional District had appealed to the British Columbia Government for relaxation of an order by the Pollution Control Board to upgrade the Annacis Island treatment plant from primary to secondary. The provincial cabinet committee upheld the principles of the original order but appointed a steering committee composed of representatives of the Fishermen's Union, the fishing industry and Greater Vancouver Regional District under chairmanship of the Environment and Land Use Secretariat to examine various alternatives which might be deemed secondary treatment. The steering committee was directed to consider conventional secondary treatment, physical-chemical treatment, mechanical treatment and increased diffusion. A technical committee was formed, including representation from the Commission, to evaluate the alternatives and advise the steering committee. The committees had not completed their report at year end.

Disinfection of sewage by chlorination is widely accepted, but it has disadvantages. Residual chlorine is acutely toxic but it can be removed by dechlorination using sulfur dioxide. Details concerning effectiveness of this process have been reported in the Commission's Progress Report No. 32. Chlorination causes formation of chlorinated organic constituents in sewage which are not removed by dechlorination using sulfur dioxide. These chlorinated constituents are toxic to fish and recent reports indicate sublethal effects occur at very low concentrations. For these and other reasons, disinfection by ozonation is attracting attention. Ozone is a powerful disinfecting agent which decays relatively fast. Although it is highly toxic to fish, it has been used successfully to disinfect water in fish hatcheries. However, there are certain technical problems associated with ozone disinfection of sewage which are now being studied in projects in Canada and the United States.

Feasibility studies continued by the British Columbia Government and Japanese interests for an integrated steel mill complex. At year end, Prince George and Kitimat were being considered as sites for this development. The technical literature reports that considerable recycle and treatment of waste-water can be practised at steel mills. However, there apparently has been difficulty in removing the high levels of ammonia which occur in some process effluents and treatment beyond that reported would probably be required to detoxify these wastewaters.

An oil company proposed construction of a refinery in the central Fraser Valley but the proposal was rejected by the regional district. The British Columbia Petroleum Corporation considered Surrey, Merritt and Clinton as possible sites for a large oil refinery but the project has been shelved following the change in Provincial Government.

A copper mine and smelter were proposed for a site seven miles west of Kamloops. Mines on the Fraser watershed generally employ recirculation of supernatant and seepage water from the tailings pond to the ore concentration process as a water pollution control method. The proposal to develop thermal power potential of the Hat Creek coal deposits 50 miles west of Kamloops, was reviewed in an environmental impact study commissioned by B. C. Hydro. The Commission will be reviewing pollution control and other fish protection facilities required at these projects in conjunction with Fisheries and Marine Service and Environmental Protection Service.

Water monitoring projects were continued and a baseline study added. The monitoring program in Kamloops Lake conducted by Weyerhaeuser Canada pulp mill obtained plankton samples which were forwarded to the Commission for measurement using methods applied to samples from throughout the watershed. Measurements of turbidity were continued at Hell's Gate and expanded to include pH and conductivity. Measurements of copper content in Anderson Lake have been conducted since six rail cars carrying copper concentrate sank in deep water as the result of a derailment in 1974. Measurements of dissolved oxygen and nitrogen were made in the Nechako River from Kenney Dam to Stuart River and in the latter river to obtain baseline data required to assess effect on salmon of possible diversion from the Nechako as part of the second stage of the Nechako-Kemano project of B. C. Hydro. A sampling program was carried out to obtain baseline measurements of some water quality characteristics in the Nadina River and tributaries before logging commences in 1977 or 1978.

Bathing beach areas of Cultus Lake have been treated annually with copper sulfate to kill snails which serve as hosts to the organism which causes swimmer's itch. Treatments prior to sockeye smolt migration and fry emergence have been conducted by Cultus Lake Parks Board under supervision by a Fisheries Officer and within constraints prescribed by the Fisheries and Marine Service and the Commission. This method of controlling swimmer's itch came under review of the Interdepartmental Pesticide Committee and was not done in 1975 pending studies to evaluate effectiveness of the method.

Through cooperative arrangement with the Fisheries Service and Environmental Protection Service, Canada Department of the Environment, numerous applications for effluent discharge permits, placer mining leases, water licences, dredging, gravel removal and construction on waterways were reviewed, and recommendations for protection of sockeye and pink salmon were made.

ENGINEERING INVESTIGATIONS AND CONSTRUCTION

The Commission continued its participation, along with the Fisheries Service and the British Columbia Fish and Wildlife Branch, in studies of a prospective second stage of the Nechako-Kemano hydroelectric project. All of the field work in connection with these studies has been financed by British Columbia Hydro and Power Authority. The Commission studies concern possible effects of such a development on the sockeye runs that migrate up the Nechako River. Additional

data on discharge, temperature and dissolved gases were collected during 1975, but the principal effort of the Commission staff was in analyses of the data obtained in 1974. A program for computer analyses was developed and the necessary data were prepared for entry to a computer. B. C. Hydro processed the data and ran the required calculations on their computer.

The analyses indicated that serious adverse temperature changes would occur if the additional diversion of Nechako River water was made. The reduction in flow in the Nechako River that would occur with the Kemano II development would result in higher water temperatures in the Nechako River, which at times would be high enough to be lethal to adult sockeye, and at other times would impose an additional stress on the sockeye that could result in death. Cold water could be discharged from the existing reservoir created by Kenney Dam to limit the temperature of the residual flow to an acceptable level of 68°F, but the supersaturation of dissolved gases would reach levels that would impose a stress on the sockeye which also could result in death. Thus the proposed Kemano II development would have unavoidable adverse effects on the environment within the Nechako River which would result in increased probability of losses of sockeye salmon en route to their spawning grounds in the Nechako River system. Such losses would reduce the production of sockeye from the current runs to the system, and the large production potential which is known to be available in the lake rearing areas in the Stellako and Stuart tributary systems would also be reduced.

The effects of the Kemano II project on water temperature and dissolved gases in the Nechako River between the Stuart River and Prince George were not studied in this investigation, nor were the effects on water temperature in the Frasèr River downstream from Prince George studied, and no conclusions can be made at this time on these aspects of the project. Further studies are being planned.

Observations were continued in 1975 to investigate problems involved in obtaining satisfactory migration of adult sockeye past the tailrace of the Seton Creek hydroelectric plant. It has been determined that under the present conditions there is a significant delay and loss of sockeye at the power plant during their migration to spawning areas in Gates and Portage Creeks. Possible methods of alleviating the problem have been studied and recommendations for remedial action were reviewed by the Commission and will be submitted to the two governments.

Plans of the Water Investigations Branch of the Government of British Columbia for flood protection in the Vedder River were reviewed and suggestions were made by fisheries agencies (Commission, Fisheries Service and Fish and Wildlife Branch) to protect the fishery resources of the river. The plans included excavation of the river bed to extreme low water level, rock protection of banks, and construction of new dykes set back from the present stream bed. Further study was planned by the Water Investigations Branch, following which there would be additional review with the fishery agencies. On December 3, 1975 a large flood occurred in the Vedder River which caused flooding of adjacent

property. The flood also caused serious disturbance and loss of the pink salmon eggs that had been deposited in the spawning grounds in October. As an emergency measure, approval was given by the Fisheries Service (with concurrence of the Commission) to obtain gravel from exposed gravel bars for repair of dykes and this work was completed in December before a second smaller freshet occurred. The flood in December has placed increased emphasis on the need for improvements to dykes and bank protection. It also emphasized the vulnerability of the pink salmon spawning areas in the Vedder River, compared to the more stable areas upstream in the Chilliwack River. The spawning channel for pink salmon proposed by the Commission for the upper part of the Chilliwack River was intended to increase the productive capability from the river, and if it had been in operation in 1975 as planned, it would have offset some of the loss that occurred in the Vedder River.

Experiments were continued in 1975 to develop equipment and techniques for gravel cleaning in natural spawning grounds. A new method of cleaning the gravel in natural spawning grounds was tested. In this method gravel is dug by machine from the stream bed and the material finer than $\frac{1}{2}$ inch passes through a screen and is deposited back in the hole dug. The gravel retained in the screen is cleaned while being vibrated in the surface flow of the stream and is then placed back in the hole over the fine material to create a 12 to 16 inch layer of highly permeable gravel.

After some preliminary testing in a small creek, the equipment was used to clean gravel in 700 lineal feet of the Nadina River Early sockeye run spawning area in July and August prior to arrival of the spawning population. The cleaned area was sampled and surveyed so that subsequent measurements can be made to determine the rate of accumulation of fine materials in the clean gravel and the stability of the stream bed. There were only 481 spawners in the Early Nadina run in 1975 and none of them spawned in the gravel cleaned by this method, although some did spawn in an adjacent area cleaned by the method used on the Horsefly River in 1973.

The 1974 Annual Report presented details of remedial work completed in the Lower Adams River in September 1974. This work was undertaken to restore the division of flow between left and right channels to that observed in 1950, when two-thirds of the flow was in the right channel. The division of flow in April, 1975 was 61% in the right channel and 39% in the left channel, compared to only 21% in the right channel in March 1973. Thus the rock groin constructed in 1974 has produced the desired change in distribution of flow. However, this section of the river will have to be checked annually to see if the situation has stabilized.

The modular crew cabin purchased last year for the Middle River area was transported to Middle River and installed, and a quonset boat shelter was also erected. Two standby diesel electric units at the Sweltzer Creek Research Laboratory were replaced with a new unit. The old units have been in service since 1948 at the Quesnel Field Station and since 1961 at the laboratory.

TABLE I
 SOCKEYE CATCH BY GEAR

<i>Gear</i>		1963	1969	1971	1975
<i>United States Convention Waters</i>					
Purse Seines	Units	171	290	182	232
	Catch	862,616	1,387,370	1,607,117	896,416
	Percent	65.65	66.45	57.07	57.32
Gill Nets	Units	450	507	650	902
	Catch	365,873	595,580	1,016,984	615,790
	Percent	27.84	28.53	36.11	39.38
Reef Nets	Units	64	46	48	65
	Catch	85,110	104,694	191,682	51,096
	Percent	6.48	5.01	6.81	3.27
Troll	Catch	446	182	346	549
	Percent	0.03	0.01	0.01	0.03
TOTAL CATCH		1,314,045	2,087,826	2,816,129	1,563,851
<i>Canadian Convention Waters</i>					
Purse Seines	Units	73	102	173	116
	Catch	115,115	602,495	1,233,531	43,201
	Percent	16.76	32.12	39.61	6.71
Gill Nets	Units	1,328	1,767	1,357	842
	Catch	561,345	1,111,186	1,689,607	550,783
	Percent	81.75	59.25	54.25	85.46
Troll	Catch	10,221	161,801	191,160	50,489
	Percent	1.49	8.63	6.14	7.83
TOTAL CATCH		686,681	1,875,482	3,114,298	644,473

NOTE: Gear counts represent a maximum number of units delivering sockeye on a single day near the peak of the run.

TABLE II
CYCLIC LANDINGS AND PACKS OF SOCKEYE
FROM CONVENTION WATERS

	<i>United States</i>	<i>Canada</i>	<i>Total</i>
1975			
Total Landings (No. Sockeye)	1,563,851	644,473	2,208,324
Share in Fish	70.82%	29.18%	
Total Pack (48-lb Cases)	127,713	55,905	183,618
Share in Pack	69.55%	30.45%	
1946-1975			
Total Landings (No. Sockeye)	50,795,052	49,578,849	100,373,901
Share in Fish	50.61%	49.39%	
Total Pack (48-lb Cases)	4,469,200	4,353,125	8,822,325
Share in Pack	50.66%	49.34%	
1975 <i>Cycle Catch</i>			
1975	1,563,851	644,473	2,208,324
1971	2,816,129	3,114,298	5,930,427
1967	2,087,826	1,875,482	3,963,308
1963	1,314,045	686,681	2,000,726
1959	1,810,738	1,581,883	3,392,621
1955	1,006,610	1,108,081	2,114,691
1951	1,136,795	1,288,162	2,424,957
1947	88,220	355,035	443,255
1943	242,077	349,011	591,088
1939	555,233	568,943	1,124,176
1935	615,502	825,508	1,441,010
1931	975,591	458,048	1,433,639
1927	1,069,557	713,930	1,783,487
1923	495,490	361,463	856,953
1919	778,669	470,199	1,248,868
1915	736,939	1,088,524	1,825,463
1911	1,447,919	730,714	2,178,633
1907	1,030,359	691,210	1,721,569
1903	1,911,127	2,341,492	4,252,619

NOTE: Pack figures include all sockeye landed even though some were sold fresh and frozen.

TABLE III
DAILY CATCH OF SOCKEYE, 1963-1967-1971-1975 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1963	1967	1971	1975	1963	1967	1971	1975	1963	1967	1971	1975
1			1,068		112,848	83,010	9,704			17,852	79,685	
2					72,265	94,322	145,517		1,282		60,079	12,595
3							94,802		1,032		87,853	
4							53,159		47		56,222	
5									10	11,025	1,411	
6			12,708		81,546					11,025	87,582	
7			8,111	72,530	48,585	5,594				11,025	69,145	
8			9,281	27,405	29,274	88,268				6,254	33,943	
9			4,588	20,843	18,439	58,194	7,447					866
10		251					155,896		28			683
11		4,465					88,141		439			
12		3,762					58,076	194,558	421	2,548		
13			1,714		37,789	152,217	39,934	124,550		7,379		
14			20,210		12,228	115,530	4,037	111,121		4,728	281	249
15			15,708	31,499	14,300	104,995	109,435			1,982	4,431	152
16		1,145	9,213	12,561		64,753	113,464				3,305	113
17		16,742					104,877				1,891	
18		12,781					108,613	99,033			175	
19			6,773				76,550	80,684			515	
20			56,405		6,193		50,385	42,852			198	
21			45,037	103,060	4,269		547		32	2,631		
22			37,835	73,338	2,680	189,061	112,368		6	604		
23	33,394					197,978	93,858					139
24	110,105	5,072				156,371	86,382					111
25	130,412	103,996				108,378	55,063					
26			16,459				19,109			11	7	
27			105,003							9	396	
28			72,329	187,942	2,648					6	116	
29			85,289	93,726	2,686						64	18
30			89,638	91,233	2,330						38	13
31					151	41,810	6,599		19			
		6,455				27,915						
		146,028				31,254	94,802					
Totals	861,998	497,080	615,041	836,316	448,231	1,519,650	1,688,765	709,171	3,316	66,767	489,366	14,839
Troll	240	143	122	189	203	34	190	316	1		6	8
Monthly Totals	862,238	497,223	615,163	836,505	448,434	1,519,684	1,688,955	709,487	3,317	66,767	489,372	14,947
June, Oct. and Nov. Totals									56	4,152	22,639	2,912
Season Totals									1,314,045	2,087,826	2,816,129	1,563,851

TABLE IV
DAILY CATCH OF SOCKEYE, 1963-1967-1971-1975 FROM CANADIAN CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1963	1967	1971	1975	1963	1967	1971	1975	1963	1967	1971	1975
1			231			19,223	114,248				19,968	232
2			Strike			16,577	189,823				34,675	28,563
3			June 26-				113,015				124,765	
4			July 10					50,455		2,170		
5			953		91,288			40,096		29,490		
6			915		70,820					27,699		11,838
7			850	36,951	54,485	73,831				476	50,720	597
8			874		44,820	184,860				639		454
9				8,136	9,987	89,770				441		40,283
10						114,059	288,641		15,879		40,196	
11			39,111				188,407	6,174	57		46,210	
12			16,037				198,973	4,731	12	55,886	32,316	
13					59,034			11,665		37,370	27,253	
14				30,328	27,942			10,241		793	3,514	7,177
15			12,044		8,205	183,161				318	18,537	223
16	784				5,783	129,684			4		18,225	131
17	1,503	10,864				104,460	190,798		2			43
18		8,744					87,209	25,011		650		12,914
19		6,984	21,756		43,585			9,082		371		
20			13,361		13,553			8,015		208	391	
21				26,256	3,146	115,565		7,752			167	
22				17,519	3,979	76,188	60,261	3,278		50,985	16,238	6,173
23	3,757				1,955	36,132	86,106		15,557		7,811	66
24	6,900	47,625					16,933					
25	22,877	21,971		Strike				40,306	6	234		3,254
26	Strike	27,672	187,654	July 25-	11,487		142,151	18,025	0	115	22,579	
27	July 12-	26,691	40,513	Aug. 24	15,577		100,315	2,516		108	2,315	
28	Aug. 4		18,266	25,123	1,175	66,008						
29				13,201	1,276	24,586						
30	19,241				590	5,799	173,063				6,281	3,378
31	21,981					4,370	54,019				2,812	13
	47,394	92,491										
Totals	124,437	243,042	332,565	157,514	468,687	1,244,273	2,003,962	237,347	61,304	207,953	548,141	115,339
Troll	1,673	32,565	21,857	2,145	5,028	125,490	166,518	41,800	3,057	3,470	2,460	6,337
Spring Salmon												
Gill Nets	732	1,142	617						618		4,783	3,571
Monthly Totals	126,842	276,749	375,039	159,659	473,715	1,369,763	2,170,480	279,147	64,979	211,423	555,387	125,247
April, June, Oct. and Nov. Totals									21,145	17,547	13,392	80,420
Season Totals									686,681	1,875,482	3,114,298	644,473

TABLE V
INDIAN CATCH OF SOCKEYE BY DISTRICT AND AREA,
1971 and 1975

<i>District and Area</i>	1971		1975	
	<i>Catch</i>	<i>No. of Fishermen*</i>	<i>Catch</i>	<i>No. of Fishermen*</i>
HARRISON-BIRKENHEAD				
Birkenhead River and Lillooet Lake	6,450	30	6,450	1
Harrison and Chehalis	500	15		
TOTALS	6,950	45	6,450	1
LOWER FRASER				
Below Hope	26,002	152	73,342	420
TOTALS	26,002	152	73,342	420
MIDDLE FRASER				
Hope to Lytton	47,556	308	72,929	1,191
Lytton to Lillooet	3,955	156	8,900	
Bridge River Rapids to Churn Creek	25,145	195	35,675	
TOTALS	76,656	659	117,504	1,191
CHILCOTIN				
Farwell Canyon to Siwash Bridge	15,150	{ 146	18,769	{ 147
Keighley Holes	175		5,412	
TOTALS	15,325	146	24,181	147
UPPER FRASER				
Churn Creek to Quesnel	6,250	146	10,375	149
Shelley	215	24	700	28
TOTALS	6,465	170	11,075	177
NECHAKO				
Nautley and Stella Reserves	6,696	45	6,603	52
TOTALS	6,696	45	6,603	52
STUART				
Fort St. James	4,453	39	2,349	31
Tachie, Pinchi and Trembleur Villages	1,883	48	4,122	70
TOTALS	6,336	87	6,471	101
THOMPSON				
Main Thompson	8,135	329	7,050	151
North Thompson	200	32		
South Thompson	455	110	505	187
TOTALS	8,790	471	7,555	338
GRAND TOTALS	153,220	1,775	253,181	2,427

* Number of permits issued to Indians in district.

The Indian catch statistics detailed above are obtained from Canada Department of the Environment, Fisheries Service. Their officers control the taking of sockeye for food by the Indian population residing throughout the Fraser River watershed.

TABLE VI
SUMMARY OF THE SOCKEYE ESCAPEMENT TO THE FRASER
RIVER SPAWNING AREAS, 1963, 1967, 1971, 1975

District and Streams	1975 Period of Peak Spawning	Estimated Number of Sockeye				Jacks	Sex Ratio	
		1963	1967	1971	1975		Males Females	
							4-5 Yr.	4-5 Yr.
LOWER FRASER								
Cultus Lake	Nov. 15-20	20,571	33,492	9,145	11,478	129	4,006	7,343
Upper Pitt River	Sept. 13-16	12,680	10,300	15,469	39,942	22	18,469	21,451
Widgeon Slough	Nov. 11-13	353	1,006	394	936	25	345	566
HARRISON								
Big Silver Creek	Sept. 25	9	0	0	31	0	15	16
Harrison River	Nov. 13-20	22,287	20,577	3,790	5,987	0	2,527	3,460
Weaver Creek	Oct. 21-26	14,469	19,730	2,887	12,195	892	4,404	6,899
Weaver Channel	Oct. 16-20	—	2,887	2,736	19,816	1,383	8,146	10,287
LILLOOET								
Birkenhead River	Sept. 23-28	67,151	58,036	32,278	92,928	31,390	24,919	36,619
SETON-ANDERSON								
Gates Creek	Sept. 7-12	4,858	1,665	797	788	418	97	273
Gates Channel	Aug. 27-Sept. 2	—	—	1,502	3,768	2,156	466	1,146
Portage Creek	Nov. 1-5	2,011	6,548	281	3,829	654	1,494	1,681
SOUTH THOMPSON								
Seymour River	Aug. 28-Sept. 1	71,690	13,361	19,028	37,024	196	19,865	16,963
Upper Adams River	Aug. 28-Sept. 1	6	—	0	23	0	13	10
Lower Adams River	Oct. 12-17	154,086	755,238	280,176	148,187	1,131	69,892	77,164
Little River	Oct. 12-17	2,436	74,490	2,821	7,268	31	3,424	3,813
South Thompson River	Oct. 12-17	45	270	10	16	0	8	8
Lower Shuswap River	Oct. 10-15	23	5,951	6,117	11,652	30	5,528	6,094
Misc. Late Runs	Oct. 10-28	0	9,981	1,169	1,442	8	685	749
NORTH THOMPSON								
Raft River	Sept. 8-12	8,724	1,303	840	2,664	55	1,181	1,428
Barriere River	—	92	16	5	0	0	0	0
Fennell Creek	Aug. 19-23	439	920	1,300	4,127	122	1,433	2,572
North Thompson River	—	70	—	888	123	3	54	66
CHILCOTIN								
Chilko River	Sept. 22-27	1,002,252	176,337	161,943	220,554	20,815	81,685	118,054
Chilko Lake South End	Sept. 9-15	—	—	12,323	55,144	10,252	11,667	33,225
Taseko Lake	Aug. 29-Sept. 2	31,667	5,700	10,500	4,394	0	2,443	1,951
QUESNEL								
Horsefly River	Aug. 30-Sept. 2	86	119	171	101	4	44	53
Upper McKinley River	—	—	—	—	100	4	44	52
NECHAKO								
Endako River	—	2,540	949	284	192	0	73	119
Nadina River (Early)	Aug. 28-Sept. 1	1,019	1,595	1,222	481	0	184	297
(Late)	Sept. 18-20	7,304	7,790	14,525	4,013	0	1,139	2,874
Nadina Channel (Late)	Sept. 17-20	—	—	—	11,306	10	4,704	6,592
Nithi River	—	763	1,688	1,796	1,144	0	437	707
Ormonde Creek	—	41	0	0	0	0	0	0
Stellako River	Sept. 29-Oct. 5	138,805	90,680	38,768	176,079	138	68,381	107,560
STUART								
Early Runs								
Driftwood River	Aug. 8	14	52	335	26	0	13	13
Forfar Creek	Aug. 3-5	652	4,815	25,178	8,864	0	4,232	4,632
Gluske Creek	Aug. 5-7	0	1,368	14,305	13,481	0	6,639	6,842
Kynoch Creek	Aug. 5-7	2,147	6,694	22,932	32,662	20	16,471	16,171
Narrows Creek	Aug. 5-7	180	454	3,467	2,216	0	1,125	1,091
Rossette Creek	Aug. 1-4	1,600	6,566	16,454	11,106	0	5,408	5,698
Misc. Streams	Aug. 1-7	34	1,120	13,271	17,144	0	8,478	8,666
Late Runs								
Kazchek Creek	—	364	92	40	—	—	—	—
Middle River	Sept. 18-22	1,838	972	485	6,704	0	3,324	3,380
Tachie River	Sept. 18-22	1,035	576	200	7,525	0	3,731	3,794
NORTHEAST								
Upper Bowron River	Aug. 27-30	25,144	31,695	25,497	29,700	0	13,009	16,691
TOTALS*		1,599,484	1,355,295	741,898	1,010,448	69,928	401,710	538,810

* Totals include small numbers of fish in small tributaries not listed in the table.

TABLE VII
DAILY CATCH OF SOCKEYE, 1960-1964-1968-1972 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1960	1964	1963	1972	1960	1964	1963	1972	1960	1964	1963	1972
1					117,041		95,135	104,974	3,777	378		
2			749		54,285			78,450		377	3,109	
3			223		45,840	79,585		57,077			2,239	
4			24		45,845	73,612		229			1,796	106
5						59,668	3,291		1,784		1,076	213
6							69,286		1,524			190
7					194,605		68,089	96	1,295			52
8					181,344		50,987	26,887	614	163		
9					126,087		57,251	264,096		152	772	
10					96,389			100,648		83	702	
11					65,882			67,670			146	
12					42,416		82,039				143	
13		3,118				25,336	24,597		CLOSED			53
14		1,463	28				3,519	3,632		314		6
15			2,662	1			357	28,126		48		5
16			4,530							104	46	
17			5,079							143		
18				2,861								
19	6,574			2,990								
20	6,823			4,696								
21	7,550											
22		6,956	2,170		CLOSED		12,075	2,809	50	50		35
23		8,672	44,615	6,394			9,103	23,404	130	56		24
24		16,773	40,911	58,086			3,314	17,222	38	49		
25			39,630	44,344			35	252		61	108	
26	78,450		44,582	53,366		5,773				13	24	31
27	38,405			50,708		1,845	3,182				14	89
28	33,335					1,205	4,458				10	879
29	32,087	79,632	15,711				2,172	137		22		211
30		54,204	96,552	7,840	3,587		33	65		6		
31		53,412	86,860	116,110	2,064			55		4	20	
					3,024	681						
Totals	209,553	224,230	384,326	347,396	978,409	280,443	488,923	775,829	9,268	1,967	10,435	1,894
Troll	142	165	90	111	851	113	66	182				
Monthly Totals	209,695	224,395	384,416	347,507	979,260	280,556	488,989	776,011	9,268	1,967	10,435	1,894
June, Oct. and Nov. Totals									746	1,169	2,030	2,780
Season Totals									1,198,969	508,087	885,870	1,128,192

TABLE VIII
DAILY CATCH OF SOCKEYE, 1960-1964-1968-1972 FROM CANADIAN CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1960	1964	1968	1972	1960	1964	1968	1972	1960	1964	1968	1972
1			875					108,624	760	1,684		
2			1,761		47,301			66,001		103	1,823	
3			2,481		194,327						5,017	
4	7,347					114,881					655	185
5	6,170					42,299			491		584	5,783
6	4,544					22,772	233,366		222			35
7							57,248		71			
8								217,308		2,491		
9					108,471			76,235		664		
10					208,985			84,294		23	748	
11	8,358				87,843						3,800	
12	4,686				34,455				1,402		206	2,184
13	4,341	2,441			102,832	88,114	38,626		464			
14					28,793	25,694	153,479		32	9		
15						2,774	15,165			9		
16						83,013						
17					96,388						39	
18	11,420			4,546	45,676	35,135					2,360	
19	14,424			4,142	56,111	15,025					13	8,694
20	24,164					5,341						
21		6,922					49,457					
22		8,331					4,318			1,393		
23							3,426	49,742				
24								15,006				
25	84,939			76,873	53,752			3,317			1,614	
26	51,124			71,895	17,274	20,527				1	610	
27	60,451					7,093	698			1		
28		49,543				953	518	13,362		3		
29		13,561					10,970					
30		12,826			2,292			22,240	614			
31					806			1,531	185			
					44,117			617				
					28,164	4,927		5,376			2,269	
Totals	281,968	93,624	296,809	157,456	954,566	400,578	559,596	870,923	4,241	6,381	19,738	16,881
Troll	670	1,775	25,627	7,005	2,092	1,637	10,841	7,540	109	15	107	627
Spring Salmon												
Gill Nets												
Monthly Totals			268	768					268	565		1,999
June, Oct. and Nov. Totals	282,638	96,074	322,704	165,229	956,911	402,215	570,437	878,463	4,618	6,961	19,845	19,507
Season Totals									11,028	9,298	7,106	18,018
									1,255,195	514,548	920,092	1,081,217

* Totals include small numbers of fish in small tributaries not listed in the table.

TABLE X
PINK SALMON CATCH BY GEAR

Gear		1969	1971	1973	1975
<i>United States Convention Waters</i>					
Purse Seines	Units	270	218	268	263
	Catch	776,533	1,905,182	1,785,699	978,042
	Percent	82.10	80.30	80.26	78.04
Gill Nets	Units	236	507	624	902
	Catch	91,609	334,202	323,370	196,726
	Percent	9.69	14.09	14.53	15.70
Reef Nets	Units	9	48	53	56
	Catch	37,331	118,904	101,729	55,223
	Percent	3.95	5.01	4.57	4.41
Troll	Catch	40,324	12,863	14,126	23,164
	Percent	4.26	0.54	0.64	1.85
TOTAL CATCH		945,797	2,371,151	2,224,924	1,253,155
<i>Canadian Convention Waters</i>					
Purse Seines	Units	65	129	137	116
	Catch	277,592	939,737	1,246,204	639,026
	Percent	32.23	43.97	60.48	50.88
Gill Nets	Units	753	1,067	995	926
	Catch	366,005	755,663	395,901	376,511
	Percent	42.48	36.29	19.21	29.98
Troll	Catch	217,908	421,937	418,574	240,353
	Percent	25.29	19.74	20.31	19.14
TOTAL CATCH		861,505	2,137,337	2,060,679	1,255,890

NOTE: Gear counts represent the maximum number of units delivering pinks on a single day near the peak of the run.

TABLE XI
LANDINGS AND PACKS OF PINK SALMON
FROM CONVENTION WATERS

	<i>United States</i>	<i>Canada</i>	<i>Total</i>
1975			
Total Landings (No. of Pinks)	1,253,155	1,255,890	2,509,045
Share in Fish	49.95%	50.05%	
Total Pack (48-lb Cases)	103,455	104,405	207,860
Share in Pack	49.77%	50.23%	
1957-1975			
Total Landings (No. of Pinks)	21,320,124	20,730,842	42,050,966
Share in Fish	50.70%	49.30%	
Total Pack (48-lb Cases)	1,530,655	1,503,321	3,033,976
Share in Pack	50.45%	49.55%	
1975 <i>Catch</i>	1,253,155	1,255,890	2,509,045
1973	2,224,924	2,060,679	4,285,603
1971	2,371,151	2,137,337	4,508,488
1969	945,797	861,505	1,807,302
1967	3,827,040	4,156,922	7,983,962
1965	558,380	592,467	1,150,847
1963	4,426,232	4,173,288	8,599,520
1961	508,544	545,128	1,053,672
1959	2,427,535	2,312,906	4,740,441
1957	2,777,366	2,634,720	5,412,086
1955	4,685,984	4,129,063	8,815,047
1953	4,951,429	4,142,117	9,093,546
1951	5,086,284	2,885,514	7,971,798
1949	6,235,400	3,189,662	9,425,062
1947	8,801,595	3,491,416	12,293,011
1945	5,458,890	1,279,849	6,738,739

NOTE: Pack figures include all pinks landed even though some were sold fresh and frozen.

TABLE XII
DAILY CATCH OF PINK SALMON, 1969-1971-1973-1975 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1969	1971	1973	1975	1969	1971	1973	1975	1969	1971	1973	1975
1		1				240	4,907			78,550	360,059	
2	13		100			4,882			124,314	90,063	330,814	280,698
3	36		140		2,639	3,215			161,294	201,457	206,254	
4			152		1,941	1,946				189,407		
5		9			2,099					4,666		
6		9								328,841		
7	23	20		307		55	14,294		2,418	390,632		53,910
8	25	4		308		7,185			8,677	262,261		32,018
9	33		1,067	324		7,161			127,783		294,472	
10			1,496			5,042		19,933	57,856		169,530	
11		1	2,615		3,627			16,127				
12		43	3,581		1,783	4,649						
13		62	3,818		2,521							
14		111		1,066	2,081							
15	443	67		840		344	22,253	23,762		6,114		146,806
16	362		5,661			7,238	15,311		42,946	144,795		132,744
17			3,799			6,577			19,249	121,411		57,264
18		34	2,908					55,608	1,072	91,232	59,485	
19		563			17,014	6,006		52,909			21,161	
20		514			22,877	5,056		53,815				
21	967	732		8,328		3,154	62,583		16,381	11,796		
22	547		6,729	5,047		45	59,992		19,181	59,887		12,387
23	665		5,110			7,257	43,693		11,860	59,521		4,707
24			4,251			9,171	20,293			33,525		
25		112			98,003	12,231					6,891	
26		2,033			119,947	13,107	137,643		5,347		3,242	
27		1,438				11,680	249,269	91,649		1,212		
28	2,080	2,391		12,707			138,583			19,789		
29	2,565	2,837		8,891					4,461	6,741		
30	1,259		6,821	7,998		5,580			2,265	7,948		2,431
31			5,114	8,130		92,273				6,865		866
Totals	9,018	10,981	53,362	53,946	274,582	221,646	631,178	451,446	605,104	2,116,713	1,518,795	723,831
Troll	5,524	1,999	7,108	7,881	32,702	8,154	5,704	11,946	1,267	1,859	598	956
Monthly Totals	14,542	12,980	60,470	61,827	307,284	229,800	636,882	463,392	606,371	2,118,572	1,519,393	724,787
June, Oct. and Nov. Totals									17,600	9,799	8,179	3,149
Season Totals					945,797	2,371,151	2,224,924	1,253,155				

TABLE XIII
DAILY CATCH OF PINK SALMON, 1969-1971-1973-1975 FROM CANADIAN CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1969	1971	1973	1975	1969	1971	1973	1975	1969	1971	1973	1975
1		24	Strike			6,406	3,396		40,906	6,913	167,083	33,756
2		15	June 26- July 10			5,243	3,452		35,463	15,269	157,615	61,793
3						5,988				27,023	157,578	
4			1		5,777			470		13,692		
5					4,773			199		13,768		78,851
6			1		5,684		24,136			33,997		74,730
7			Strike				14,643		91,986			50,827
8			July 6- July 15	50			13,373		29,915	141,120		58,485
9			1	11		20,059	2,572	186	25,639	81,037	39,434	
10						17,280	1,481	70	17,039	86,916	50,859	
11			3		6,345	15,145		165	108,797	58,168	36,599	
12			5		3,674			121		46,851	27,396	
13					4,641		23,520			31,098		
14				18			24,987			84,631		62,355
15	34	20	40			16,750	38,368			26,718		45,604
16			90			9,010						33,961
17			84						11,653		58,070	29,163
18			59		25,980			6,347	10,891		12,299	58,966
19					12,711			11,200			7,441	
20					414			9,559				
21				243			79,374	14,866		14,866		
22	74		7,155	130			71,878	7,649		7,649		
23	85					23,135	125,369	14,836		172,256		45,221
24						25,979	10,591	9,634	2,206	27,182		2,800
25			5,601			17,141			2,196		31,267	
26			4,415	Strike				96,884			1,191	10,910
27			192	July 25- Aug. 24	1,074	73,040	178,434	85,765		47,551	34,996	14,358
28	273	57	57	712		90,929	131,738	94,303		8,392		
29	1,848	217	217	382			28,293			1,299		
30	2,315				36,049	224,988				29,454		
31	2,044		2,963		49,946	145,573			477	17,488	11,317	508
	1,324		3,472									
Totals	8,026	578	23,880	1,546	157,068	696,666	775,605	329,739	377,168	943,343	781,828	659,047
Troll	35,622	41,634	93,200	72,114	150,136	245,984	248,042	56,040	26,298	121,281	52,393	99,598
Spring Salmon												
Gill Nets									55,538	16,822	7,305	14,358
Monthly Totals	43,658	42,212	117,080	73,660	307,204	942,650	1,023,647	385,779	459,004	1,081,446	841,526	773,003
June and Oct. Totals									51,639	71,029	78,426	23,448
Season Totals									861,505	2,137,337	2,060,679	1,255,890

TABLE XIV
SUMMARY OF THE PINK SALMON ESCAPEMENT TO THE
FRASER RIVER SPAWNING AREAS

District and Streams	1975 Period of Peak Spawning	Estimated Number of Pink Salmon				
		1969	1971	1973	1975	
EARLY RUNS						
LOWER FRASER						
Main Fraser _____	Oct. 7-12	848,532	928,046	766,053	315,049	
HARRISON						
Chehalis River _____	Oct. 10-12	7,147	32,178	14,300	2,356	
FRASER CANYON						
Coquihalla River _____	Oct. 4-8	2,415	16,778	11,994	5,933	
Jones Creek _____	Oct. 3-6	1,779	1,304	2,544	2,645	
Misc. Tributaries _____	Oct. 3-15	450	3,298	3,549	948	
SETON - ANDERSON						
Seton Creek _____	Oct. 13-16	180,011	267,079	181,027	209,734	
Upper Seton Channel _____	Oct. 13-16	3,975	6,007	6,708	7,995	
Lower Seton Channel _____	Oct. 13-16	14,868	24,882	23,602	23,874	
Portage Creek _____	Oct. 18-21	1,092	1,456	13,983	28,454	
Bridge River _____	Oct. 13-16	13,034	8,817	23,738	10,803	
THOMPSON						
Thompson River and Tributaries _____	Oct. 5-15	247,896	258,203	283,385	480,350	
TOTAL*		1,321,199	1,553,363	1,331,002	1,088,341	
LATE RUNS						
HARRISON						
Harrison River _____	Oct. 16-19	96,390	73,881	196,150	180,052	
Weaver Creek _____	Oct. 15-20	525	1,141	255	411	
Weaver Channel _____	Oct. 15-19	200	294	640	1,201	
CHILLIWACK-VEDDER						
Chilliwack-Vedder River ____	Oct. 17-20	92,222	160,511	210,799	81,137	
Sweltzer Creek _____	Oct. 23-27	18,923	13,122	15,265	16,121	
TOTAL*		208,260	250,389	423,109	278,922	
GRAND TOTAL *		1,529,459	1,803,752	1,754,111	1,367,263	

* Totals may include small numbers of fish in small tributaries not listed in the table.

TABLE XV
SUMMARY OF THE PINK SALMON ESCAPEMENTS TO
UNITED STATES AND CANADIAN NON-FRASER
RIVER SPAWNING AREAS*

<i>United States Spawning Areas</i>	1969	1971	1973	1975
Nooksack	15,000	40,000	75,000	36,000
Skagit	100,000	300,000	250,000	100,000
Stillaguamish	75,000	200,000	35,000	30,000
Snohomish	70,000	125,000	110,000	65,600
Puyallup	16,000	40,000	12,000	11,800
Dosewallips	20,000	45,000	25,000	5,500
Duckabush	20,000	50,000	18,000	4,500
Dungeness	14,400	46,000	47,000	24,500
Elwha	1,500	4,000	9,600	1,500
Miscellaneous	8,200	22,000	13,400	11,200
TOTALS	340,100	872,000	595,000	290,600

<i>Canadian Non-Fraser Spawning Areas</i>	1969	1971	1973	1975
Jervis Inlet	31,000	47,600	10,830	24,300
Howe Sound	23,600	23,700	135,500	105,000
Burrard Inlet	8,500	35,000	75,000	35,000
TOTALS	63,100	106,300	221,330	164,300

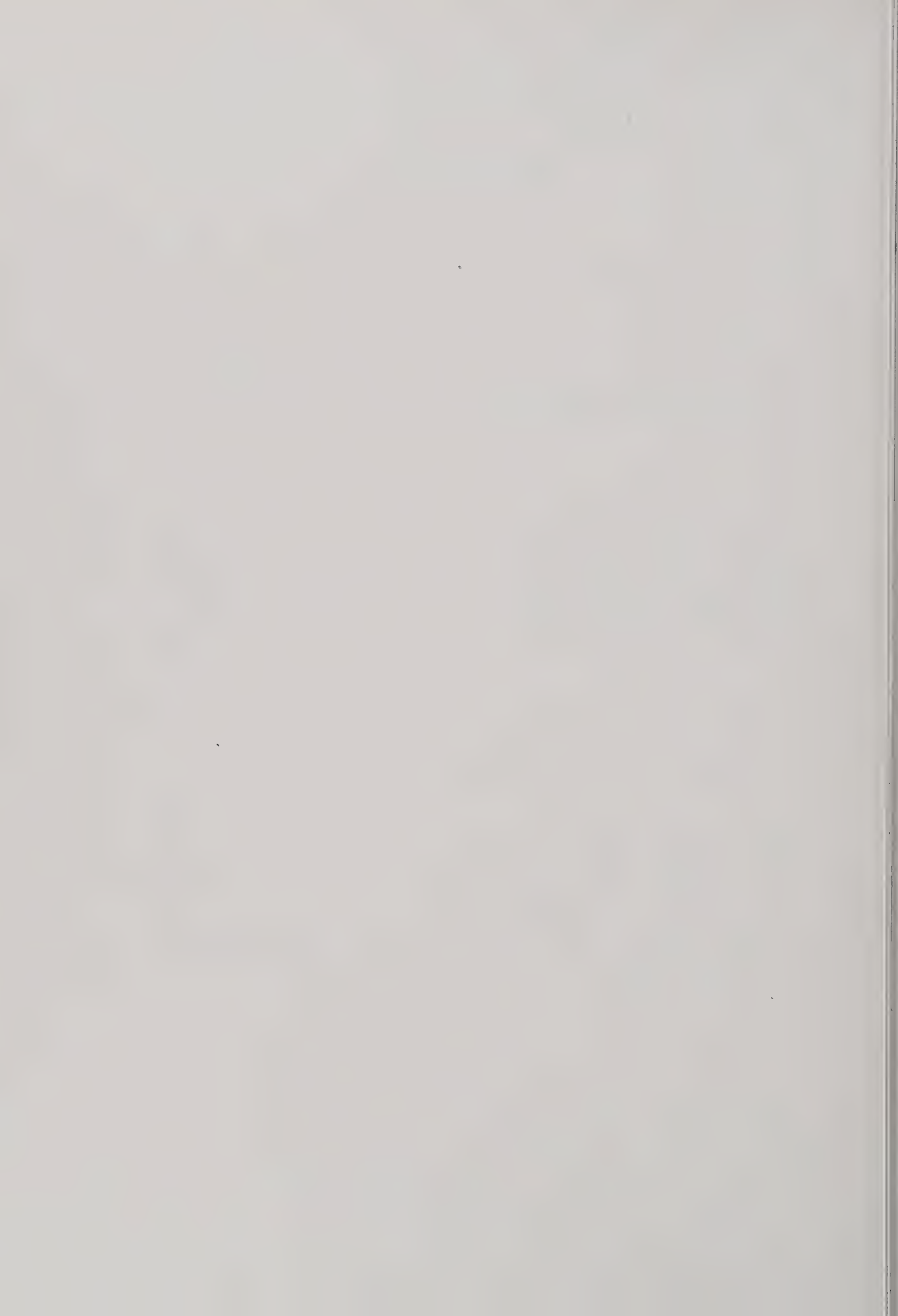
* These data were provided through the courtesy of the Washington State Department of Fisheries and the Canada Department of the Environment, Fisheries Service.

COMMISSION PUBLICATIONS, 1975

1. Annual Report of the International Pacific Salmon Fisheries Commission for 1974.
2. Progress Report Number 32. Dechlorination of Municipal Sewage Using Sulfur Dioxide by D. W. Martens and J. A. Servizi.

STAFF PUBLICATIONS IN OTHER JOURNALS

Fish Toxicants in Kraft Effluents by I. H. Rogers, J. C. Davis, G. M. Kruzynski, University of British Columbia, H. W. Mahood, Environment Canada, Fisheries and Marine Service, and J. A. Servizi and R. W. Gordon, International Pacific Salmon Fisheries Commission. Journal of the Technical Association of the Pulp and Paper Industry, Vol. 58, No. 7, July 1975.



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